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EXECUTIVE SUMMARY OF HISTORICAL SEDIMENT DATA
Site Investigation
Portland Harbor Area of the Willamette River

Prepared for

U.S. Environmental Protection Agency
Region X
1200 Sixth Avenue
Seattle, Washington 98101

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EXECUTIVE SUMMARY OF HISTORICAL SEDIMENT DATA SITE INVESTIGATION PORTLAND HARBOR AREA OF THE WILLAMETTE RIVER

1. INTRODUCTION

This memorandum presents a summary of existing sediment chemical data for the Portland Harbor portion of the Willamette River. The study area is defined by the Willamette River, extending from river mile (RM) 3.5 to RM 9. Analytical data were gathered by the Oregon Department of Environmental Quality (ODEQ) personnel from a variety of studies completed by both agency personnel and contractors representing private industrial clients. A complete summary of data sources is listed in a bibliography provided at the end of this document. Data quality was not reviewed and no quality assurance and control (QA/QC) measures were implemented to evaluate the usability of the available data. In addition, data were not compared to biological effects-based criteria to identify areas of concern, nor were water quality data included in this technical memorandum.

2. GENERAL FEATURES OF THE WILLAMETTE RIVER

The Willamette River originates in the Cascade Range and flows approximately 260 miles north before discharging into the Columbia River, which flows an additional 100 miles westward to the Pacific Ocean. The point of confluence of the Willamette and Columbia rivers denotes RM 0. Surface waters of the Willamette River in the study area are classified as tidal freshwater. Most development along the Willamette River has occurred in the study area, referred to as the Portland Harbor. Habitat in the Willamette River near Portland has been altered to accommodate urban development and a growing shipping industry. Artificial structures (e.g., piers, wharves, etc.) in the harbor have changed the natural shoreline to riprap, bulkheads and sand-beached lagoons. Because of dredging, many portions of the river are steeply sloped and maintain substrates comprised mainly of silts and sands (Farr et al., 1991).

3. SUMMARY OF KNOWN SEDIMENT CONTAMINATION

To date, 17 industrial operations have been identified as potential sources of the contamination to the Willamette River within the 5.5-mile study area. These 17 sites include the following industries:

- Site 1 - Time Oil Co.— Northwest Terminal
- Site 2 - Linnton Oil Fire Training Grounds
- Site 3 - GATX Facility
- Site 4 - Port of Portland — Terminal 4

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- Site 5 - ARCO Bulk Terminal
- Site 6 - Mobil Oil Bulk Plant
- Site 7 - Time Oil Co. — Linnton Terminal
- Site 8 - U.S. COE — Portland Moorings
- Site 9 - GASCO
- Site 10 - McCormick and Baxter Creosoting
- Site 11 - Rhone-Poulenc, Inc.
- Site 12 - Gould, Inc.
- Site 13 - Elf Atochem North America
- Site 14 - Riedel Environmental Services
- Site 15 - Willbridge Bulk Fuel Area (Chevron, Shell, Unocal)
- Site 16 - Port of Portland — Ship Repair Yard
- Site 17 - Gunderson, Inc.

Numerous past investigations have been conducted at varying levels of scope. A portion of studies focused on specific properties, while the remaining studies were river-wide and incorporated sediment sampling as one component of the entire study. Of the 17 investigated industrial facilities, only ten included the collection and analysis of sediment. Of the numerous river-wide studies that have been performed on the Willamette River, four incorporated sediment sampling within the 5.5-mile study area. Sediment chemical data are provided in Appendix A.

A discussion of existing sediment chemical data and known active and inactive industrial operations is summarized below on a mile-by-mile basis. **Figures 1 through 4** display areas where concentrations for specific contaminant classes of potential concern were measured.

3.1 River Mile 3.5 to 4

Three potential sources of contamination are present between RM 3.5 and RM 4: the Time Oil — Northwest Terminal (Site 1), the Linnton Oil Fire Training Grounds (Site 2), and the GATX Facility (Site 3). The major contaminants of potential concern at all three facilities are polycyclic aromatic hydrocarbons (PAHs).

The Time Oil — Northwest Terminal is an active petroleum product bulk storage and handling facility and tank farm. Koppers Co. leased tanks from Time Oil for pentachlorophenol (PCP) product formulation and storage from 1967 to 1982. During 1980, Crosby and Overton leased tanks for waste oil storage. Spills in 1985, 1986, 1990, and 1994 have occurred at the property and on-site soils have been impacted. A soil removal action was implemented in 1985. An on-site slurry bioreactor was constructed in 1988 to treat contaminated soil. The system was not able to reach the target treatment level of 0.5 ppm PCP, and treatment operations were terminated in 1989 with the soil stockpile remaining on-site (ODEQ, 1997r).

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The Linnton Oil Fire Training Grounds operated as a fire fighting training area from 1951 to 1988. Concentrations of petroleum constituents have been detected in on-site soils and groundwater. Arsenic, chlorinated solvents, and PAHs were also detected (ODEQ, 1997b).

The GATX facility is an active bulk oil storage facility that has been operational since 1903. Benzene, toluene, ethylbenzene, and total xylenes (BTEX) were detected in an adjacent monitoring well located on the Linnton Planing Mill property and are suspected to have migrated from the GATX site (ODEQ, 1997c).

To date, no sediment samples have been collected during any of the investigations associated with these three facilities.

3.2 River Mile 4 to 5

Terminal 4 (Site 4), operated by the Port of Portland, is a potential source of contamination between RM 4 and RM 5. Terminal 4 operates as a ship loading and unloading facility. Coal tar pitch has reportedly spilled from shore-based cranes into the river on several occasions (1986–1987). A sediment removal action excavated 35,000 yd³ of contaminated sediment from Slip 3 in December 1994 and January 1995. Various other fuel and oil releases—including a potential diesel fuel release from an underground transfer pipeline—have been identified on-site. Free petroleum and petroleum-contaminated groundwater were discharged to the Willamette River along the eastern edge of Slip 3. An interim groundwater remediation system does not appear to adequately preclude additional releases from the site to the river (ODEQ, 1997d). Review of available sediment chemical data indicated that pencil pitch, low molecular weight PAHs (LPAHs), high molecular weight PAHs (HPAHs), 4,4'-DDE, 4,4'-DDD, arsenic, cadmium, copper, lead, mercury, nickel, and zinc were detected in sediment (ODEQ, 1997d).

Data collected as part of an investigation evaluating stormwater discharges in the Willamette River indicated numerous metals, volatile organic compounds (VOCs), and base-neutral acid extractables (BNAs) were present in sediment samples collected at and in the vicinity of a 36-inch municipal outfall located in Slip 1 (Hancock and Johnson, 1995).

3.3 River Mile 5 to 6

Three potential sources of contamination are present between RM 5 and RM 6: the ARCO Bulk Terminal (Site 5), the Mobil Oil Bulk Plant (Site 6), and Time Oil — Linnton Terminal (Site 7). Major contaminants of potential concern at both facilities are PAHs. All properties are active bulk petroleum facilities.

The ARCO Bulk Terminal has been active since 1963. Past investigations at the terminal have revealed groundwater contamination beneath the site, with free product present in six monitoring wells. According to ODEQ files, the magnitude of free product at the site may be extensive (ODEQ, 1997e). No sediment data were available for review.

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The Mobil Oil Bulk Plant has been active since 1928. In 1985, a petroleum spill of 46,000 gallons occurred; 11,000 gallons was not recovered. Past investigations have revealed extensive gas and oil contamination in soil and groundwater. A remedial investigation and feasibility study (RI/FS) is currently being conducted at the site. Data available for review indicated that six sediment samples were collected at unknown locations from a beach area of the Willamette River adjacent to the Mobil Oil Bulk Plant. Sediment from all stations was analyzed for total petroleum hydrocarbons. BTEX and fuel hydrocarbons (diesel) were also analyzed at one of the six stations. Petroleum hydrocarbons were detected at all stations, while BTEX and diesel were detected in one sample collected adjacent to the site (ODEQ, 1997f).

The Time Oil Linnton Terminal is an active bulk petroleum facility. Spills have occurred at the property in the past and groundwater and soil have been monitored. A soil removal action was implemented in 1988. The Time Oil Linnton Terminal is considered a low priority site to the State of Oregon (ODEQ, 1997a). No sediment data were available for review.

3.4 River Mile 6 to 7

Two potential sources of contamination are present between RM 6 and RM 7: the U.S. Army Corps of Engineers (COE) — Portland Moorings site (Site 8) and the GASCO site (Site 9).

The Portland Moorings site, active from 1904 to present, serves as a maintenance port for COE vessels. Yard activities (i.e., sandblasting, scaling, repair, painting, refueling) have reportedly contaminated nearshore sediments. Sediment samples were collected at nearshore locations within the Willamette River adjacent to the U.S. Moorings site. Sediment was analyzed for metals, PAHs, polychlorinated biphenyls (PCBs)/pesticides, dioxins/furans, phthalates, phenols, and tributyltin (TBT). Concentration of numerous metals (including arsenic, copper, chromium, lead, tin, and zinc), LPAHs, HPAHs, dioxins/furans, numerous pesticides, and Aroclor 1260 were detected in several of the sediment samples (ODEQ, 1997g; Siipola, 1995; Squier Associates, 1992).

The GASCO site, a former oil gasification plant, now operates in the capacity of a liquid natural gas plant. All gasification wastes were historically (1913-1925) discharged into the Willamette River. Wastes were reportedly later disposed of in large on-site settling ponds. Significant contamination is likely to be present in subsurface soils and groundwater (Hahn and Associates, 1996).

Documents provided for review indicated that 14 stations were sampled for sediment during remedial investigation activities at the Gasco site in January 1996. Three sampling stations were located in two on-site settling ponds, six stations were situated in the Willamette River adjacent to the site, and the remaining five stations were located upriver of the GASCO facility. Sediment samples were analyzed for BTEX constituents, PAHs, diesel/oil, gasoline, total lead, and total organic carbon (TOC). Surface (0.5 ft below ground surface [bgs]) and subsurface (2 to 9.5 ft

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bgs) sediment was collected from all Willamette River stations. Gasoline, diesel fuel, and numerous LPAHs and HPAHs were detected in the sediment samples. In general, PAHs were measured at higher concentrations in surface sediment than in subsurface sediment collected adjacent to the site, while this trend was reversed at stations located upgradient of the site (Hahn and Associates, 1996).

Data from a second river-wide study (ODEQ, 1994) indicated that arsenic, chromium, copper, cadmium, lead, nickel, zinc, mercury, DDE, DDD, DDT, PCB-1248, Aroclor 1260, and numerous LPAHs and HPAHs were present in sediment collected at the Saint Johns Bridge at RM 6.

Additional river-wide studies (ODEQ, 1994; Tetra Tech, 1992) indicated that arsenic, chromium, copper, cadmium, lead, zinc, mercury, DDE, DDD, DDT, Aroclor 1260, and numerous LPAHs and HPAHs were present in sediment collected at the Spokane, Portland and Seattle (SP&S) Railroad Bridge at RM 7.

3.5 River Mile 7 to 8

Six potential sources of contamination are present between RM 7 and RM 8: McCormick and Baxter Creosoting (Site 10), Rhone-Poulenc, Inc. (Site 11), Gould, Inc. (Site 12), Elf Atochem North America (Site 13), Riedel Environmental Services (Site 14), and the Willbridge Bulk Fuel Area (Site 15).

The McCormick and Baxter Creosoting Company, active from 1944 to 1991, operated a wood-treating facility. Site contamination is primarily attributed to releases from these wood-treating activities and on-site disposal of wastes. Substantial contamination of nearshore sediment has been documented. Capping of approximately 15 acres of nearshore contaminated sediment has been recently proposed in addition to a long-term monitoring program (EPA, 1996).

During remedial investigation activities, 55 surface sediment samples and 38 subsurface (ranging from 1.5 to 72 feet bgs) sediment samples were collected and analyzed for site-related contaminants. In addition, selected samples were analyzed for a broad range of other organic and inorganic contaminants, including pesticides, PCBs, VOCs, and dioxins/furans (EPA, 1996).

Review of available sediment chemical data indicated that chromium, copper, arsenic, zinc, pentachlorophenol, dioxins/furans, and numerous LPAHs and HPAHs were present in surface and subsurface sediment. Subsurface sample data indicated that contamination may extend as deep as 35 feet in nearshore areas (EPA, 1996).

Other notable features of the site include four outfalls (001 through 004). Historically, Outfall 001 was used to discharge non-contact cooling water to the river; the other three outfalls discharged stormwater runoff. Two of these outfalls (001 and 002) had NPDES permits.

Following the closure of the facility, earthen berms were placed around the stormwater collection

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sumps to minimize off-site discharges from these outfalls. Currently, stormwater at the site infiltrates into the subsurface upland soils, and groundwater treated in the on-site treatment system is discharged to the river via Outfall 002 (EPA, 1996).

The Rhone-Poulenc site (Site 11) operated as a production facility for agricultural chemicals from the mid-1940s to 1990. Site activities included discharging untreated wastes on-site and treated process wastewater to Doane Lake, which subsequently discharged to the Willamette River. Site-related contaminants have been detected in surface water discharging to the Willamette River via an outfall. Groundwater on- and off-site is contaminated with site-related contaminants. A groundwater treatment system was installed in 1993.

Sediment was collected from three stations located adjacent to the Rhone-Poulenc site in the nearshore area of the Willamette River. Three organochlorine pesticides (4,4'-DDE, 4,4'-DDD, and 4,4'-DDT) were detected in the collected samples. 4,4'-DDE and 4,4'-DDT were detected at two of the three stations, while 4,4'-DDD was detected at all three stations. Disulfoton (an organophosphorus pesticide) was detected in one sediment sample. Dioxins and furans were detected in each of the three samples collected from the river. Semivolatile organic compounds (SVOCs), phenols, and chlorinated herbicides were not detected in any of the sediment samples (Woodward Clyde, 1995).

Active from 1949 to 1981, the Gould, Inc., site (Site 12) operated a battery processing facility. Operations at the site included on-site battery disposal and disposal of residuals into neighboring Doane Lake. Some battery casing were reportedly buried on the adjacent Rhone-Poulenc property. Two-thousand tons of lead-bearing material are currently piled on-site, while 80,000 tons of the same material is buried. Over the course of operations at the site, approximately 6.5 million gallons of sulfuric acid was discharged into Doane Lake. Air, water, groundwater, and soil are reportedly contaminated and remedial activities are ongoing under EPA supervision (ODEQ, 1997L).

Lead, arsenic, chromium, and zinc were detected in sediments collected from the Willamette River near the Gould, Inc., property during August 1986 and February 1987. Cadmium and hexavalent chromium concentrations were near or below detection limits (Dames and Moore, 1987).

Elf Atochem North America (Site 13), active from 1941 to the present, is a chlorine production facility, that also produces sulfuric acid, hydrogen, sodium chlorate, and sodium hydroxide. Six chemical spills were reported at the facility in 1986. Some soil removal actions have occurred. Notable features of the site include four NPDES-permitted outfalls that discharge to the Willamette River. Concentrations of DDT have been reportedly measured in on-site soil. To date, no sediment samples have been collected during any of the investigations associated with the Elf Atochem site (ODEQ, 1997k).

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Riedel Environmental Services (Site 14) operated a hazardous waste storage area from 1980 to 1984. Riedel operated in marine construction and dredging, and specialized in marine spill cleanups. Past studies have shown that soil and groundwater are contaminated extensively with a wide variety of compounds. Numerous underground storage tanks (USTs) have also leaked on-site.

Sediment samples were collected from seven stations situated in the nearshore waters adjacent to the Riedel site. PCBs were not detected in these samples with a detection limit of 200 mg/kg. TBT was detected in six of the seven sediment samples. Arsenic, chromium, lead, and nickel were also detected in collected samples (ODEQ, 1997n).

The Willbridge Bulk Fuel Area (Site 15) is currently utilized by Shell, Chevron, and Unocal. Remedial investigations have been conducted since the 1970s. Free product and dissolved-phase contamination from petroleum product are present beneath all three facilities. Groundwater is contaminated with metals and DDT. To date, no sediment samples have been collected during any of the investigations associated with the Willbridge Bulk Fuel Area site (ODEQ, 1997o).

3.6 River Mile 8 to 9

Two potential sources of contamination are present between RM 8 and RM 9: the Port of Portland — Ship Repair Yard (Site 16) and Gunderson, Inc. (Site 17).

The Port of Portland-Ship Repair Yard is an active ship repair facility with multiple dry docks. The facility has been cited for inadequate cleaning of dry docks prior to submersion, and extensive discharge of sandblast grit into the Willamette River has occurred (ODEQ, 1997p). Sediment beneath three of the dry docks is contaminated with metals, TBT, and PCBs. Sediment was collected from 26 nearshore stations situated in waters associated with Berth 311, Dry Dock No. 1, Dry Dock No. 2, Dry Dock No. 3, and Dry Dock No. 4. Samples were analyzed for selected metals, pesticides, PCBs, SVOCs, VOCs, and TBT (Donaldson and Futornick, 1997).

PCBs (Aroclors 1254 and 1260) were detected in samples collected near Dry Dock No. 3 and Berth 311. Pesticides were not detected in any of the sediment samples. TBT was detected in all sediment samples. Arsenic, chromium, cadmium, copper, lead, mercury, nickel, silver, and zinc were also detected (Donaldson and Futornick, 1997).

Gunderson, Inc.(Site 17), a rail car manufacturing facility, has been operating since 1985. Similar operations and salvage work have occurred on the property since the 1940s. Leaks and spills from degreasing operations, leaking USTs, sandblasting, painting, and salvage yard operations are suspected to have resulted in contamination of soil and groundwater. Some tank decommissioning has occurred and several vapor extraction wells were installed on-site in 1996. To date, no sediment samples have been collected during any of the investigations specifically associated with the Gunderson site (ODEQ, 1997m).

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Sediment data collected from an investigation extending from RM 8.0 to RM 10.2 indicated that various metals, numerous HPAHs and LPAHs, 4,4'-DDD, 4,4'-DDE, delta-BHC, and endosulfan II were present in sediment collected from three stations positioned offshore of the Gunderson property (Britton, 1992).

Data collected as part of an investigation evaluating stormwater discharges in the Willamette River indicated that numerous metals, VOCs, and BNAs were present in sediment samples collected at and in the vicinity of a 60-inch municipal outfall located in the Swan Island Channel (Hancock and Johnson, 1995).

In addition, data from a river-wide study (Tetra Tech, 1992) indicated that arsenic, chromium, copper, cadmium, lead, zinc, silver, mercury, Aroclor 1254, Aroclor 1260, and numerous LPAHs and HPAHs were present in sediment samples collected from the Swan Island Channel.

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References

Anderson, C.W., F.A. Rinella, and S.A. Rounds. 1996. Occurrence of Selected Trace Elements and Organic Compounds and Their Relation to Land Use in the Willamette River Basin, Oregon, 1992-94. U.S. Geological Survey, Water-Resources Investigations Report 89-4051. Prepared in cooperation with the U.S. Army Corps of Engineers.

Britton, J. 1992. Lower Willamette River Sediment Evaluation—Portland Harbor. Prepared by J. Britton, CENPP-PE-HR, U.S. Army Corps of Engineers.

Dames & Moore, Inc. 1987. Remedial Investigation Final Report, Gould, Inc., Site. 16 November 1987.**

Donaldson, D., and K. Futornick. 1997. Letter report transmitted to Gil Wistar, Oregon Department of Environmental Quality from D. Donaldson, Port of Portland and K. Futornick, Cascade General.**

Farr, R.A., and D.L. Ward. 1992. Fishes of the Lower Willamette River, Near Portland, Oregon. Fishes of the Willamette River—Draft. Oregon Department of Fish and Wildlife, Research and Development. Clackamas, Oregon.

Final Executive Summary and Steering Committee Recommendations, Lower Columbia River Bi-State Water Quality Program. June 1996.

Fuhrer, G. J. 1989. Quality of Bottom Material and Elutriates in the Lower Willamette River, Portland Harbor, Oregon. U.S. Geologic Survey, Water Resources Investigations Report 89-4005. Prepared in cooperation with the U.S. Army Corps of Engineers.

Fuhrer, G. J., and D. Evans 1989. Use of Elutriate Tests and Bottom-Material Analyses in Simulating Dredging Effects on Water Quality of Selected Rivers and Estuaries in Oregon and Washington, 1980-1983. U.S. Geologic Survey, Water Resources Investigations Report 89-4005. Prepared in cooperation with the U.S. Army Corps of Engineers.

Hahn and Associates, Inc. 1996. Data Package for Remedial Investigation/Feasibility Study—Northwest Natural Gas Company Gasco Facility, 7900 NW St. Helens Road, Portland, Oregon. Prepared by Hahn and Associates, Inc., Portland, Oregon, for Northwest Natural Gas Company. 22 July 1996.**

Hancock, D. 1995. Water Quality Monitoring During Dredging and Disposal of Sediments from Terminal 4 Slip 3 in Portland Harbor: Final Report. Prepared by Hartman Associates, Inc., Seattle, Wash. and Houston, Texas for the Port of Portland. 28 April 1995.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Hancock, D. R., and S. Johnson. 1995. Chemical Characterization of Sediments Adjacent to Storm Water Discharges in the Willamette River Near Portland. Prepared by Danil R. Hancock, Hartman & Associates, Inc. and Steven Johnson, Fishman Environmental Services, for the U.S. Environmental Protection Agency, Region 10, Seattle, Washington. 20 February 1995.

Harrison, H.E., C.W. Anderson, F.A. Rinella, T.M. Gasser, and T.R. Pogue, Jr. 1995. Analytical Data from Phases I and II of the Willamette River Basin Water Quality Study, Oregon, 1992-94. U.S. Geological Survey, Open-File Report 95-373. Prepared in cooperation with the Oregon Department of Environmental Quality, Willamette River Technical Advisory Steering Committee and the National Water-Quality Assessment Program.

Jones, H.B. 1997. Chief, Planing and Engineering Division, U.S. Army Corps of Engineers, Portland District. Transmittal of water quality evaluation reports: (1) Combined Sewer System Study, outfall basin description maps; (2) Results of the 1988 Lower Willamette River Sediment Quality Testing—USACE Portland District O&M Dredging.

Maul, Foster & Associates. 1996. Willamette-Western Site Investigation. August-September 1996.**

Nicholson, G. 1992. CH2M Hill. Phase 1 Technical Memorandum 5.4A, prepared by Gordon Merseth, PE, CH2M Hill and Dave Felstul, BCC, regarding water quality monitoring program results related to the Portland CSO Management Study, transmitted to Lester E. Lee, PE, Bureau of Environmental Services, City of Portland, Oregon, 2 September 1992.

Oregon Department of Environmental Quality. 1997a. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 1989; Site Name: Time Oil Linnton Terminal. 28 March 1997.

Oregon Department of Environmental Quality. 1997b. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 1189; Site Name: Linnton Oil Fire Training Grounds. 28 March 1997.

Oregon Department of Environmental Quality. 1997c. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 1096; Site Name: GATX St. Helens RD Facility. 28 March 1997.

Oregon Department of Environmental Quality. 1997d. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 272; Site Name: Port of Portland—Terminal 4. 28 March 1997.

Oregon Department of Environmental Quality. 1997e. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 1528; Site Name: Arco Bulk Terminal. 28 March 1997.

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Oregon Department of Environmental Quality. 1997f. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 137; Site Name: Mobil Oil Bulk Plant—St. Helens RD. 28 March 1997.

Oregon Department of Environmental Quality. 1997g. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 1641; Site Name: U.S. Army Corps of Engineers—Portland Moorings. 28 March 1997.

Oregon Department of Environmental Quality. 1997h. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 84; Site Name: GASCO. 28 March 1997.

Oregon Department of Environmental Quality. 1997i. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 74; Site Name: McCormick & Baxter Creosoting Co. 28 March 1997.

Oregon Department of Environmental Quality. 1997j. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 155; Site Name: Phone-Poulenc Inc.—NW St. Helens RD. 28 March 1997.

Oregon Department of Environmental Quality. 1997k. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 398; Site Name: Elf Atochem North America. 28 March 1997.

Oregon Department of Environmental Quality. 1997l. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 49; Site Name: Gould Inc./NL Industries Inc.. 28 March 1997.

Oregon Department of Environmental Quality. 1997m. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 1155; Site Name: Gunderson Inc. 28 March 1997.

Oregon Department of Environmental Quality. 1997n. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 277; Site Name: Riedel Environmental Services—N Portland Yard. 28 March 1997.

Oregon Department of Environmental Quality. 1997o. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 1549; Site Name: Willbridge Bulk Fuel Area. 28 March 1997.

Oregon Department of Environmental Quality. 1997p. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 271; Site Name: Port of Portland—Ship Repair Yard. 28 March 1997.

This document was prepared by Roy F. Weston, Inc. expressly for the EPA. It shall not be disclosed in whole or in part without the express, written permission of the EPA.

Oregon Department of Environmental Quality. 1997q. Staff Report Recommended Remedial Action for the Mobil Oil Terminal Site, Portland, Oregon. 1997. Prepared by Oregon Department of Environmental Quality, Waste Management and Cleanup Division, Site Response Section.***

Oregon Department of Environmental Quality. 1997r. Environmental Cleanup Site Information Database—Site Summary Report, Site ID: 170; Site Name: Time Oil Company—Northwest Terminal. 28 May 1997.

Oregon Department of Environmental Quality, Water Quality Division. 1994. Willamette River Toxics Study, 1988/1991.

Rickert, D.A., V.C. Kennedy, S.W. McKenzie, and W.G. Hines. 1977. A Synoptic Survey of Trace Metals in Bottom Sediments of the Willamette River, Oregon. River-Quality Assessment of the Willamette River Basin, Oregon: Geological Survey Circular 715-F.**

Rosetta, T. 1995. Water Quality Department, Oregon Department of Environmental Quality. Willamette River Basin Water Quality Study Phase II—Preliminary Report, Compilation and Evaluation of Toxics Data (1985-1995).

Siirola, M.D. 1996. Results of U.S. Moorings May 1995 Sediment Study. U.S. Army Corps of Engineers, Portland District.

Wistar, G. 1997. Oregon Department of Environmental Quality. Transmittal of Data Package for Remedial Investigation/Feasibility Study, Northwest Natural Gas Company, Gasco Facility, 7900 NW St. Helens Road, Portland, Oregon, 22 July 1996 (Appendix C—Sediment Core Logs). Prepared for Northwest Natural Gas Company, Portland, Oregon, by Hahn and Associates, Inc., Portland Oregon.

Squier Associates. 1992. Vicinity Map depicting U.S. Moorings, Portland, Oregon (1"=2000').**

Tetra Tech, Inc. 1992. Reconnaissance Survey of the Lower Columbia River—Task 6: Draft Reconnaissance Report, Volume 1. Prepared for the Lower Columbia River Bi-State Water Quality Program by Tetra Tech, Bellevue, Washington, in association with EVS Consultants and David Evans & Associates. May 1992.

Tetra Tech, Inc. 1992. Reconnaissance Survey of the Lower Columbia River—Task 7: Conclusions and Recommendations. Prepared for the Lower Columbia River Bi-State Water Quality Program by Tetra Tech, Bellevue, Washington, in association with EVS Consultants and David Evans & Associates. June 1992.

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Tetra Tech, Inc. 1992. Willamette River Basin Water Quality Study—Component 2: Review and Summary of Toxic Pollutants in the Willamette River and Major Tributaries. Prepared by Tetra Tech, Inc., Bellevue, Washington, for the Oregon Department of Environmental Quality. 27 August 1992.

Tetra Tech, Inc. 1995. Willamette River Basin Water Quality Study—A Summary of Recent Scientific Reports on the Willamette River. Prepared for the Oregon Department of Environmental Quality by Tetra Tech, Redmond, Washington. 11 August 1995.

Tetra Tech, Inc. 1995. Willamette River Basin Water Quality Study—Summary and Synthesis of Study Findings: Final Report. Prepared for the Oregon Department of Environmental Quality by Tetra Tech, Redmond, Washington. 11 August 1995.

U.S. Environmental Protection Agency. 1996. Record of Decision—McCormick and Baxter Creosoting Company Portland Plant, Portland, Oregon. Prepared in cooperation with the Oregon Department of Environmental Quality.**

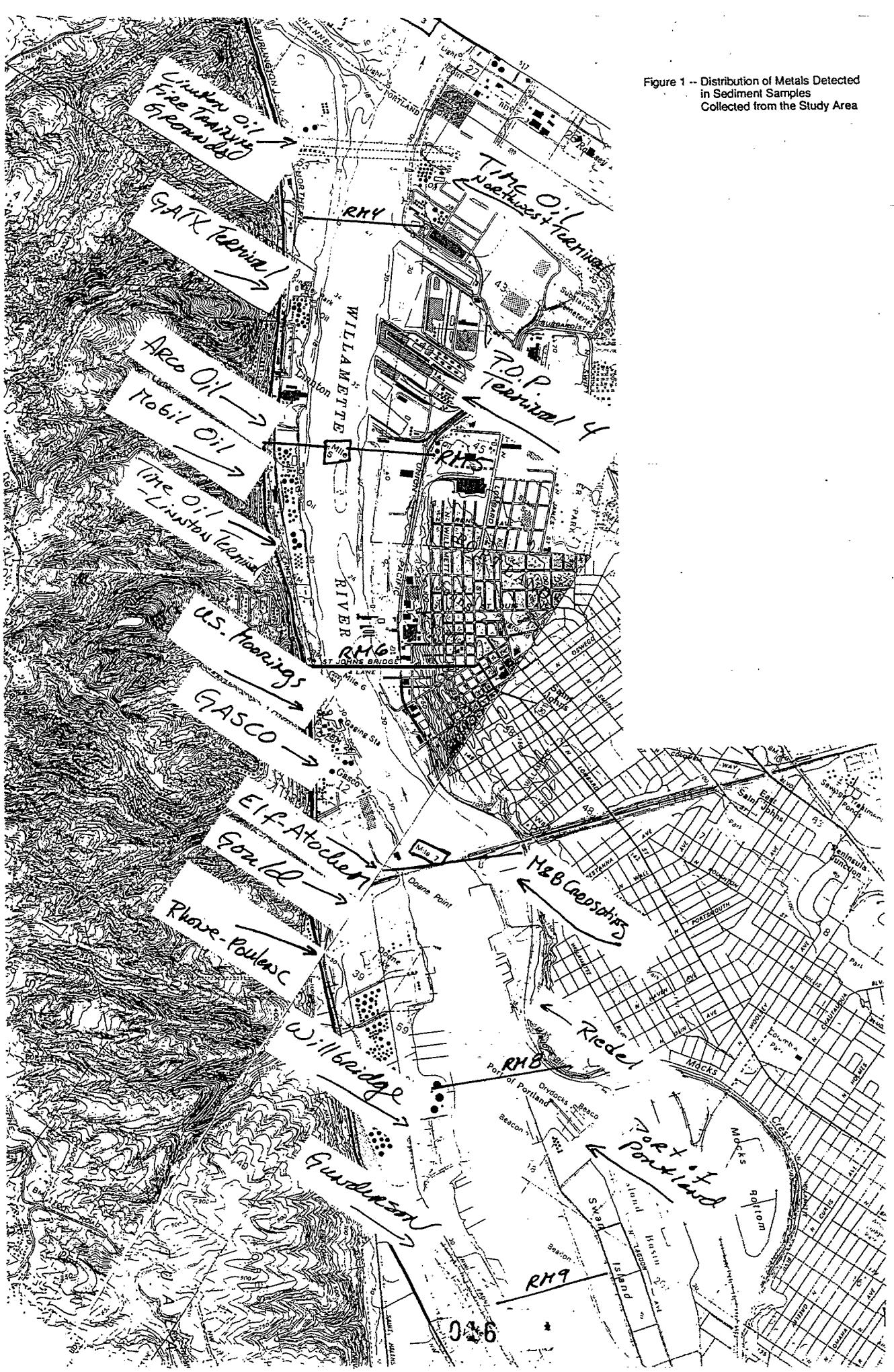
Wiltsey, M. 1996. Memorandum from M. Wiltsey, State of Oregon Department of Environmental Quality, regarding Summary of Consultant's Assessment of City of Portland, CSO-related Sediment Conditions in the Willamette River at Portland, Oregon (Prepared by LTI, Limno-Tech, Inc. for the Bureau of Environmental Services, 18 August 1993). 13 December 1996.

Woodward Clyde Consultants. 1995. Quarterly Progress Report, 1st Quarter 1995, Surface Water and Sediment—Rhône-Poulenc AG Company St. Helens Road Facility, Portland, Oregon. Prepared by Woodward Clyde Consultants, Portland, Oregon, for Rhône-Poulenc AG Company, Research Triangle Park, North Carolina.**

Youness, S. 1993. Technical Memorandum 5.4c—Assessment of CSO-Related Sediment Conditions in the Willamette River at Portland, Oregon. Prepared by LTI, Limno-Tech, Inc., for the Bureau of Environmental Services. 18 August 1993.

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Figure 1 -- Distribution of Metals Detected in Sediment Samples Collected from the Study Area



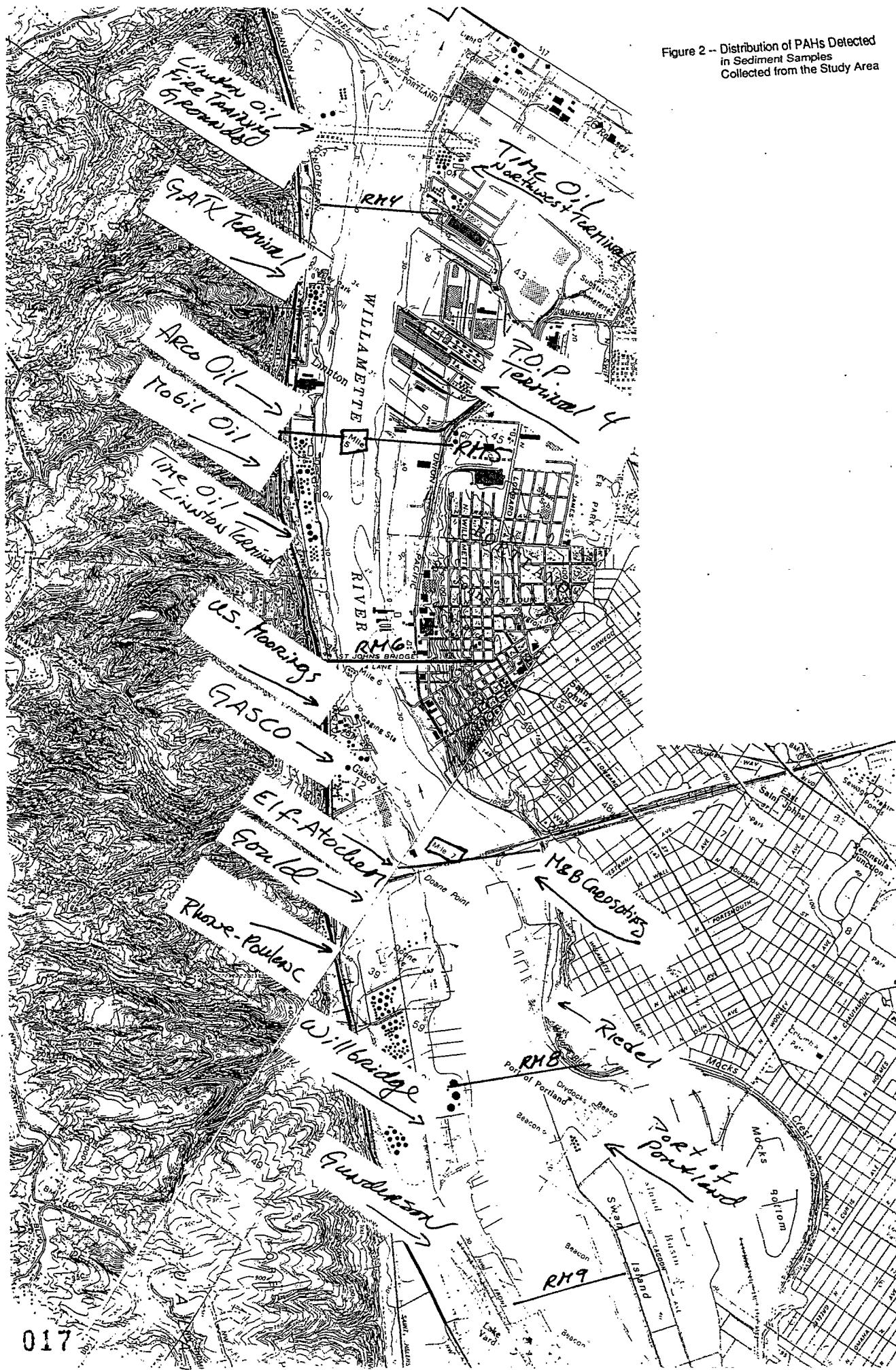
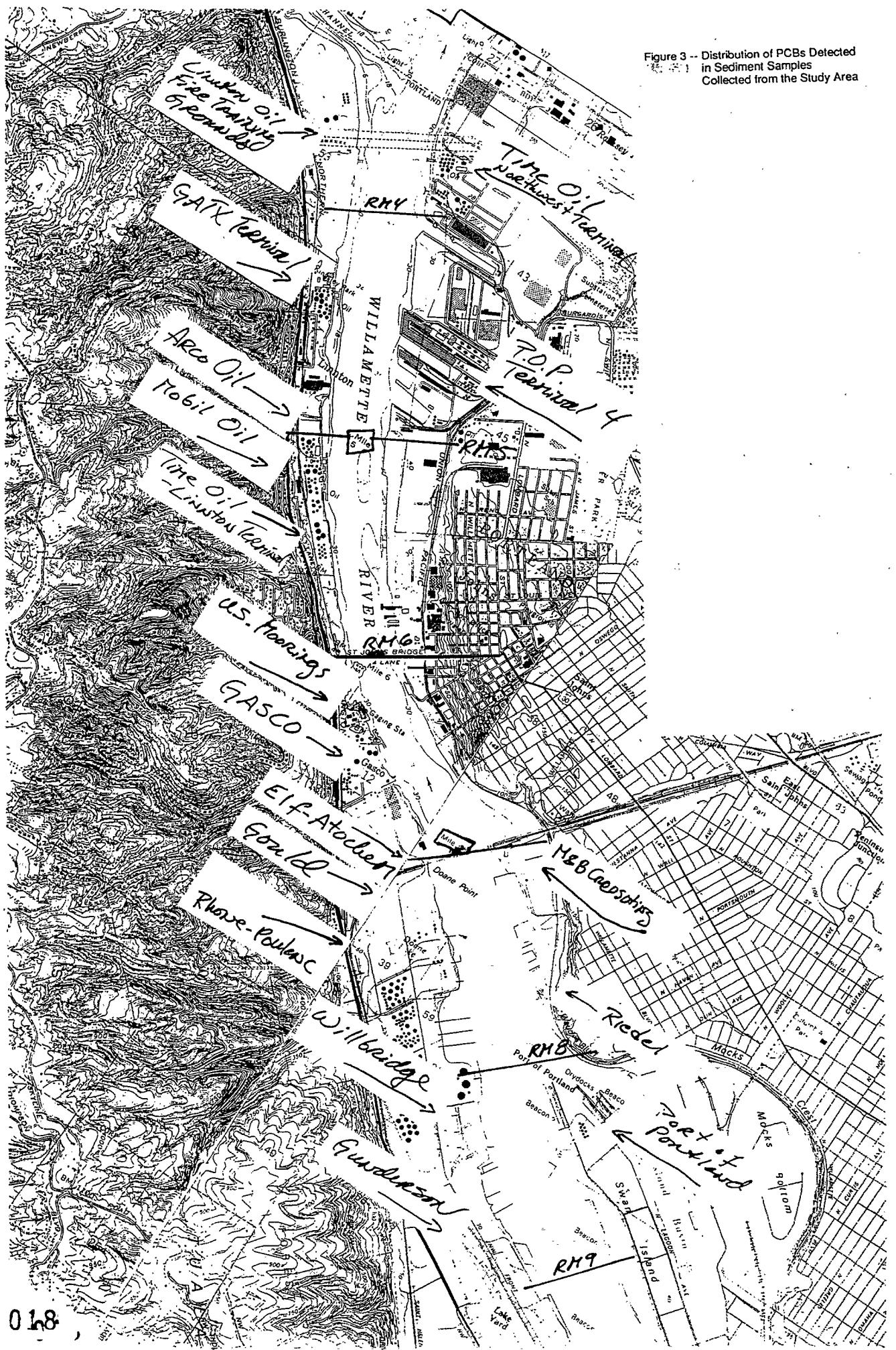
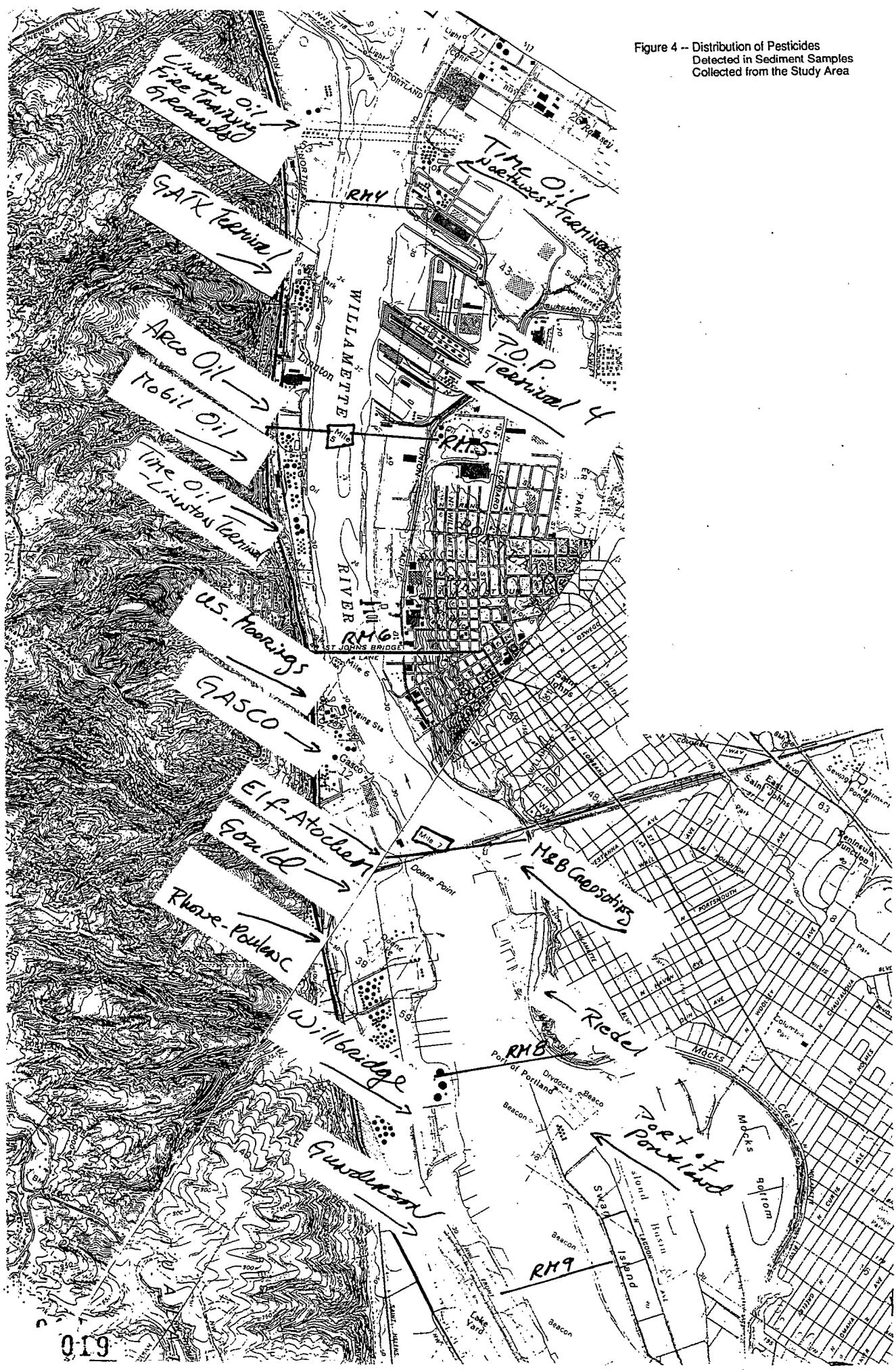


Figure 2 -- Distribution of PAHs Detected
in Sediment Samples
Collected from the Study Area

Figure 3 -- Distribution of PCBs Detected
in Sediment Samples
Collected from the Study Area



**Figure 4 -- Distribution of Pesticides
Detected in Sediment Samples
Collected from the Study Area**



APPENDIX A

SEDIMENT CHEMISTRY DATA

APPENDIX A

SEDIMENT CHEMISTRY DATA

Number

- A-1 Site 4 - Port of Portland — Terminal 4
- A-2 Site 6 - Mobil Oil Bulk Plant
- A-3 Site 7 - U.S. COE — Portland Moorings
- A-4 Site 8 - GASCO
- A-5 Site 9 - McCormick and Baxter Creosoting Company
- A-6 Site 10 - Rhone-Poulenc, Inc.
- A-7 Site 11 - Gould, Inc.
- A-8 Site 13 - Riedel Environmental Services
- A-9 Site 15 - Port of Portland — Ship Repair Yard

River Wide Studies — Chemistry Data

- A-10 Willamette River Toxics Study 1988-1991, DEQ Water Quality Division (Gene Foster & Barbara Stifel), 7/94.
- A-11 Technical Memorandum 5.4c — Assessment of CSO-Related Sediment Conditions in the Willamette River at Portland, Oregon, Limno-Tech, Inc. (for Portland Bureau of Environmental Services), 8/18/93.
- A-12 Fuhrer, Gregory J. 1989. Quality of Bottom Material and Elutriates in the Lower Willamette River, Portland Harbor, Oregon. U.S. Geologic Survey, Water Resources Investigations Report 89-4005. Prepared in cooperation with the U.S. Army Corps of Engineers.
- A-13 McKenzie, S.W., 1977, Analyses of bottom material from the Willamette River, Portland Harbor, Oregon: U.S. Geological Survey Open-File Report 77-740, 8p.
- A-14 Appendix B from: Tetra Tech, Inc. 1992. Willamette River Basin Water Quality Study— Component 2: Review and Summary of Toxic Pollutants in the Willamette River and Major Tributaries. Prepared by Tetra Tech, Inc., Bellevue, Washington, for the Oregon Department of Environmental Quality. 27 August 1992.

APPENDIX A-1

SEDIMENT CHEMISTRY DATA

SITE 4 - PORT OF PORTLAND — TERMINAL 4

SITE ID: 272

Port of Portland - Terminal 4

SITE SUMMARY REPORT

MANNER AND TIME OF RELEASE:

Coal tar pitch repeatedly spilled from shore-based crane and shovel into river. Time of release: 3/28/86. Apparent diesel fuel release from underground Union Pacific Railroad fuel transfer pipeline. (Time of release unknown). Various other diesel fuel and oil releases of unclear origin.

CONTAMINATION INFORMATION:

(1/31/91 MJZ/SAS) This is the location of a ship to rail car transfer facility. Pencil pitch (coal tar pitch) has been spilled into the water and has contaminated sediments. A shore-based crane and shovel dumps granulated pencil pitch into a mechanical device that discharges it to rail cars. The pitch has been repeatedly discharged into the river over the years. Used by smelters to make aluminum, pencil pitch is a suspected carcinogen that can harm humans through skin contact, inhalation, or ingestion. Pollution control experts say they know little about its effects on fish. Cleanup proceedings are on hold pending EPA enforcement action, which may include cleanup. The old facility is not being used and the Port has built a new facility. Specific pencil pitch spills occurred 10/16/87 and 3/28/86. (3/24/97; SMF:NWR:SAS) 35,000 cubic yards of pencil-pitch contaminated sediments removed from Slip 3 (December 1994, through January 1995) under federal Consent Decree (May 7, 1993; USA v. Port of Portland, Case Number CV 93-267 RE). Sediments buried in Ross Island Lagoon (USACOE Permit 94-549, 8/18/94). Court ordered cleanup criterium: cleanup to 0.5-percent pencil pitch in Slip 3 sediments. Free petroleum and petroleum-contaminated groundwater were subsequently found to be discharging to the Willamette River along the eastern edge of Slip 3 (December 1992 - January 1993). Subsurface soils and shallow groundwater between the eastern edge of Slip 3 (to the west) and a Union Pacific Railroad fuel transfer facility (to the east) are extensively contaminated with #1 diesel fuel, #2 diesel fuel, and oil. Solvent, or solvent-like, odors have also been noted in subsurface soils (at 4 feet bgs) at the location of former Quaker State Oil Company ASTs. Port of Portland installed an "interim" groundwater remediation system along the eastern edge of Slip #3 in February 1993, but system malfunctions and capacity limitations (1993-1996) have not precluded additional releases to the river.

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PATHWAYS:

Surface waters of Willamette River, sediments in river. Potential "trench worker" exposure to petroleum-contaminated subsurface soils and groundwater. Port of Portland maintains a "Municipal" Water Right within the river at Terminal 4, although that Water Right has not been exercised for Drinking Water purposes.

<u>SUBSTANCE CONTAMINATION</u>				
<u>SUBSTANCE</u>	<u>MEDIA CONTAMINATED</u>	<u>CONCENTRATION LEVEL</u>	<u>EVIDENCE</u>	<u>OBSERV. DATE</u>
ACENAPHTHENE	Sediment Date released: unknown	8.2 ppm	Laboratory Data	

SITE ID: 272

Port of Portland - Terminal 4

SITE SUMMARY REPORT

	Quantity Released: unknown	
BENZO(a) ANTHRACENE	Sediment 20 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
BENZO(a) PYRENE	Sediment 20 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
BENZO(b) FLUORANTHENE	Sediment 81 ppm (and Benzo(k) Fluoranthene Date released: unknown Quantity Released: unknown	Laboratory Data
BENZO(ghi) PERYLENE	Sediment 14 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
CADMIUM	Sediment 27.1 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
CHROMIUM	Sediment 51 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
CHRYSENE	Sediment 30 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
DDD, p,p'	Sediment 14 ug/Kg Date released: unknown Quantity Released: unknown	Laboratory Data
DDE, p,p'	Sediment 59J ug/Kg Date released: unknown Quantity Released: unknown	Laboratory Data
FLUORANTHENE	Sediment 47 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
FLUORENE	Sediment 3 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
INDENO(1, 2, 3-cd) PYRENE	Sediment 15 ppm Date released: unknown Quantity Released: unknown	Laboratory Data

SITE ID: 272

Port of Portland - Terminal 4

SITE SUMMARY REPORT

LEAD	Sediment 890 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
MERCURY	Sediment 1.4 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
NAPHTHALENE	Sediment 1.5 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
PHENANTHRENE	Sediment 29 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
POLYAROMATIC HYDROCARBONS (PAH)	Sediment 280 ppb Other loading machine Date released: 3/28/86 Quantity Released: 100 tons Data Source: Port of Portland files	Laboratory Data
CHRYRENE	Sediment 46 ppm Date released: unknown Quantity Released: unknown	Laboratory Data
ZINC	Sediment 3,690 ppm Date released: unknown Quantity Released: unknown	Laboratory Data

MEDIA CONTAMINATION COMMENTS:

Coal tar pitch (pencil pitch) may be accumulating in river and sediments. Subsurface soils and shallow groundwater of fill material between Slip 3 and a Union Pacific Railroad fuel transfer facility (to the east) are contaminated with #1 and #2 diesel fuels and oil. Contamination appears to extend into underlying natural alluvium. Free product and contaminated groundwater have been discharging to the river at Slip 3.

ENVIRONMENTAL/HEALTH THREATS:

Surface water and food chain. Potential "trench worker" exposure to petroleum contaminated subsurface soils and groundwater. A "Municipal Drinking Water Supply" Water Right within the river at Terminal 4, held by Port of Portland COULD be exercised, although the Port has no long range plans to do so (water

SEDIMENT DATA

FROM MARINER

4/28/95

Terminal 4 Slip 3
Port of Portland

January 5, 1995 Sediment Monitoring Results

Pencil Pitch

Sample ID	Type	Date	Pencil Pitch (% wt)	Exceedance (0.5% wt)
T40105-C4	Core	1/5/95	0.23	
T40105-C7	Core	1/5/95	0.38	
T40105-P4	Grab	1/5/95	0.011	
T40105-P23	Grab	1/5/95	0.26	
T40105-P13	Grab	1/5/95	0.087	
T40105-P22	Grab	1/5/95	0.98	*
T40105-P24	Grab	1/5/95	0.1	
T40105-P12	Grab	1/5/95	0.078	
T40105-P10	Grab	1/5/95	0.22	
T40105-P11	Grab	1/5/95	0.15	

January 7, 1995 Sediment Monitoring Results

Pencil Pitch

Sample ID	Type	Date	Pencil Pitch (% wt)	Exceedance (0.5% wt)
T4107-C6S	Core	1/7/95	0.15	
T4107-C6B	Core	1/7/95	0.1	
T4107-C5B	Core	1/7/95	ND	
T40107-P21	Grab	1/7/95	ND	
T40107-P20	Grab	1/7/95	0.084	
T40107-P19	Grab	1/7/95	0.13	
T40107-P15	Grab	1/7/95	0.12	
T40107-P18	Grab	1/7/95	0.12	
T40107-P16	Grab	1/7/95	0.056	
T40107-P14	Grab	1/7/95	ND	
T40107-P17	Grab	1/7/95	0.1	

January 5, 1995 Sediment Monitoring Results
% Solids, Metals

Sample ID	Type	Date	Total Solids (%)	METALS (ppm)									
				Antimony	Arsenic	Cadmium	Chromiu	Copper	Lead	Mercury	Nickel	Silver	Zinc
T40105-C4	Core	1/5/95	46	0.48	6.2	1.8	25	76	280	ND	21	2	360
T40105-C7	Core	1/5/95	64	0.37	5.7	1.8	19	43	180	ND	17	1.6	270
T40105-P4	Grab	1/5/95	60	ND	2.4	0.65	20	33	99	ND	22	1.2	140
T40105-P23	Grab	1/5/95	65	0.28	3.8	1.4	17	42	220	ND	18	1.5	280
T40105-P13	Grab	1/5/95	58	ND	4	1.5	14	460	83	ND	1300	0.88	240
T40105-P22	Grab	1/5/95	61	ND	4.2	1.4	19	40	180	ND	18	1.2	300
T40105-P24	Grab	1/5/95	72	0.19	2.5	0.74	14	27	79	0.13	17	0.8	160
T40105-P12	Grab	1/5/95	66	ND	2.4	0.58	15	28	77	ND	16	0.84	140
T40105-P10	Grab	1/5/95	38	0.57	7.1	2.1	31	97	380	0.15	23	2.4	460
T40105-P11	Grab	1/5/95	64	0.29	4.4	0.99	18	45	160	ND	17	1.3	220

January 7, 1995 Sediment Monitoring Results
% Solids, Metals

Sample ID	Type	Date	Total Solids (%)	METALS (ppm)									
				Antimony	Arsenic	Cadmium	Chromiu	Copper	Lead	Mercury	Nickel	Silver	Zinc
T4107-C6S	Core	1/7/95	55	0.28	8	1.5	16	54	140	ND	12	0.42	290
T4107-C6B	Core	1/7/95	70	ND	4.8	0.74	18	69	93	ND	21	0.22	210
T4107-C5B	Core	1/7/95	59	ND	7.5	1.1	23	48	170	0.1	18	0.38	300
T40107-P21	Grab	1/7/95	60	ND	5	0.56	18	31	79	ND	16	0.24	160
T40107-P20	Grab	1/7/95	46	ND	7	0.71	26	52	78	0.15	22	0.41	200
T40107-P19	Grab	1/7/95	44	ND	11	1.9	28	82	230	ND	24	0.93	380
T40107-P15	Grab	1/7/95	45	ND	6.9	1.3	24	57	170	0.13	20	0.47	270
T40107-P18	Grab	1/7/95	46	ND	7.9	1	20	59	150	0.14	15	0.47	230
T40107-P16	Grab	1/7/95	51	0.29	5.6	1.5	21	53	160	ND	17	0.4	260
T40107-P14	Grab	1/7/95	68	ND	4.6	0.67	18	26	90	ND	15	0.27	160
T40107-P17	Grab	1/7/95	63	ND	7.2	0.74	18	41	110	ND	17	0.26	170

Sample ID	Type	Latitude	Longitude	Pencil Pitch (% wt)	Total Solids (%)	Metals (ppm)									
						Antimony	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc
T41227-P1	Grab	45 36 56	122 46 14	0.34	52	1.9	22	11	22	92	790	0.14	20	2.3	960
T41227-P2	Grab	45 45 36	122 46 14	0.2	58	2.1	16	4.1	19	72	540	ND	19	1.1	680
T41227-P3	Grab	45 45 36	122 46 18	0.34	44	0.79	15	3.4	23	120	400	0.12	17	1.4	460
T41227-P4	Grab	45 35 30	122 46 02	0.58	39	1.7	17	4.7	33	150	640	0.15	25	2.5	650
T41227-P5	Grab	45 35 52	122 46 17	0.4	50	1.3	14	5.1	24	94	510	0.1	22	1.7	620
T41227-P6	Grab	45 36 19	122 46 32	0.31	48	0.35	10	3.6	27	69	340	0.11	22	1	500
T41227-P7	Grab	45 37 27	122 46 28	0.5	42	0.91	12	2.6	31	100	400	ND	28	1.4	490
T41227-P8	Grab	45 38 26	122 46 31	0.31	44	1.1	17	4.7	27	100	510	0.15	24	1.8	600
T41227-P9	Grab	45 37 42	122 47 40	0.25	39	ND	15	1.7	20	96	400	0.16	26	1.6	600
T41227-C1S	Core	45 39 30	122 45 30	0.34	43	1.2	16	3.9	19	120	460	0.25	17	1.4	480
T41227-C1B	Core			0.096	72	2.8	70	5.5	14	250	440	0.094	13	1.9	550
T41227-C2S	Core	45 36 06	122 46 20	0.9	54	ND	9.1	4.3	25	92	660	0.23	24	1.5	750
T41227-C2B	Core			0.24	63	0.31	4.5	2.4	21	47	380	0.17	22	1	390
T41227-C3S	Core	45 36 56	122 46 14	ND	47	2.3	80	6.4	26	290	490	0.16	27	2.5	900
41227-C3B	Core			ND	71	ND	1.5	0.47	20	22	30	0.15	18	0.17	65



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PAH'S by EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: 94-4007
Matrix: sedime
Received: 12/27/1994
Sampled: 12/27/1909
Prepared: 12/29/94
Analyzed: 01/02/94

Client ID	Lab ID	Analyte	Result	MRL
T41227P1 *1	94-4007-4	Acenaphthene	ND	24
		Acenaphthylene	110	24
		Anthracene	6600	24
		Benzo(a)anthracene	34000	24
		Benzo(a)pyrene	30000	24
		Benzo(b)fluoranthene	38000	24
		Benzo(g,h,i)perylene	17000	24
		Benzo(k)fluoranthene	12000	24
		Chrysene	28000	24
		Dibenzo(a,h)anthracene	4400	24
		Fluoranthene	34000	24
		Fluorene	2600	24
		Indeno(1,2,3-cd)pyrene	18000	24
		Naphthalene	1100	24
		Phenanthrene	22000	24
		Pyrene	38000	24
		Pencil pitch	3400000	240000

Port of Portland
Terminal 4 sediment sample data sheet

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report

-029



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PAH'S by EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: 94-4007
Matrix: sedime
Received: 12/27/1994
Sampled: 12/27/1994
Prepared: 12/29/94
Analyzed: 01/02/94

Client ID	Lab ID	Analyte	Result	MRL
T41227P2	94-4007-5	Acenaphthene	3300	21
		Acenaphthylene	ND	21
		Anthracene	3000	21
		Benzo(a)anthracene	18000	21
		Benzo(a)pyrene	18000	21
		Benzo(b)fluoranthene	23000	21
		Benzo(g,h,i)perylene	11000	21
		Benzo(k)fluoranthene	ND	21
		Chrysene	18000	21
		Dibenzo(a,h)anthracene	2800	21
		Fluoranthene	22000	21
		Fluorene	1500	21
		Indeno(1,2,3-cd)pyrene	11000	21
		Naphthalene	570	21
		Phenanthrene	12000	21
		Pyrene	22000	21
		Pencil pitch	2000000	210000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S by EPA 8270 - Modified GC/MS in SIM Mode
Results in ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: 94-4007
Matrix: sedime
Received: 12/27/1994
Sampled: 12/27/1994
Prepared: 12/29/94
Analyzed: 01/02/94

Client ID	Lab ID	Analyte	Result	MRL
T41227P3	94-4007-6	Acenaphthene	5300	41
		Acenaphthylene	ND	41
		Anthracene	4700	41
		Benzo(a)anthracene	29000	41
		Benzo(a)pyrene	32000	41
		Benzo(b)fluoranthene	45000	41
		Benzo(g,h,i)perylene	20000	41
		Benzo(k)fluoranthene	ND	41
		Chrysene	32000	41
		Dibenzo(a,h)anthracene	6000	41
		Fluoranthene	42000	41
		Fluorene	2600	41
		Indeno(1,2,3-cd)pyrene	20000	41
		Naphthalene	890	41
		Phenanthrene	23000	41
		Pyrene	37000	41
		Pencil pitch	3400000	410000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report

Q31



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PAH'S by EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: 94-4007
Matrix: sedime
Received: 12/27/1994
Sampled: 12/27/1994
Prepared: 12/29/94
Analyzed: 01/02/94

Client ID	Lab ID	Analyte	Result	MRL
T41227P4 *	94-4007-7	Acenaphthene	ND	17
		Acenaphthylene	49	17
		Anthracene	ND	17
		Benzo(a)anthracene	51000	17
		Benzo(a)pyrene	65000	17
		Benzo(b)fluoranthene	93000	17
		Benzo(g,h,i)perylene	26000	17
		Benzo(k)fluoranthene	26000	17
		Chrysene	49000	17
		Dibenz(a,h)anthracene	7900	17
		Fluoranthene	81000	17
		Fluorene	3700	17
		Indeno(1,2,3-cd)pyrene	28000	17
		Naphthalene	1700	17
		Phenanthrene	32000	17
		Pyrene	65000	17
		Pencil pitch	5800000	170000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S by EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: 94-4007
Matrix: sedime
Received: 12/27/1994
Sampled: 12/27/1994
Prepared: 12/29/94
Analyzed: 01/02/94

Client ID	Lab ID	Analyte	Result	MRL
T41227P5 *1	94-4007-8	Acenaphthene	ND	17
		Acenaphthylene	42	17
		Anthracene	ND	17
		Benzo(a)anthracene	36000	17
		Benzo(a)pyrene	45000	17
		Benzo(b)fluoranthene	60000	17
		Benzo(g,h,i)perylene	21000	17
		Benzo(k)fluoranthene	21000	17
		Chrysene	34000	17
		Dibenz(a,h)anthracene	3000	17
		Fluoranthene	55000	17
		Fluorene	3200	17
		Indeno(1,2,3-cd)pyrene	23000	17
		Naphthalene	1700	17
		Phenanthrene	24000	17
		Pyrene	43000	17
		Pencil pitch	4000000	170000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S by EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: 94-4007
Matrix: sedime
Received: 12/27/1994
Sampled: 12/27/1994
Prepared: 12/29/94
Analyzed: 01/02/94

Client ID	Lab ID	Analyte	Result	MRL
T41227P6	94-4007-9	Acenaphthene	5400	41
		Acenaphthylene	ND	41
		Anthracene	4600	41
		Benzo(a)anthracene	29000	41
		Benzo(a)pyrene	31000	41
		Benzo(b)fluoranthene	38000	41
		Benzo(g,h,i)perylene	16000	41
		Benzo(k)fluoranthene	18000	41
		Chrysene	27000	41
		Dibenzo(a,h)anthracene	4000	41
		Fluoranthene	38000	41
		Fluorene	2100	41
		Indeno(1,2,3-cd)pyrene	17000	41
		Naphthalene	1100	41
		Phenanthrene	20000	41
		Pyrene	35000	41
		Pencil pitch	3100000	410000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S by EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: 94-4007
Matrix: sedime
Received: 12/27/1994
Sampled: 12/27/1994
Prepared: 12/29/94
Analyzed: 01/02/94

Client ID	Lab ID	Analyte	Result	MRL
T41227P7 *1	94-4007-10	Acenaphthene	ND	17
		Acenaphthylene	71	17
		Anthracene	ND	17
		Benzo(a)anthracene	48000	17
		Benzo(a)pyrene	64000	17
		Benzo(b)fluoranthene	76000	17
		Benzo(g,h,i)perylene	24000	17
		Benzo(k)fluoranthene	ND	17
		Chrysene	43000	17
		Dibenz(a,h)anthracene	4000	17
		Fluoranthene	76000	17
		Fluorene	3800	17
		Indeno(1,2,3-cd)pyrene	26000	17
		Naphthalene	1800	17
		Phenanthrene	28000	17
		Pyrene	55000	17
		Pencil pitch	5000000	170000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S by EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: 94-4007
Matrix: sedime
Received: 12/27/1994
Sampled: 12/27/1994
Prepared: 12/29/94
Analyzed: 01/02/94

Client ID	Lab ID	Analyte	Result	MRL
T41227P8	94-4007-11	Acenaphthene	ND	17
		Acenaphthylene	73	17
		Anthracene	5000	17
		Benzo(a)anthracene	31000	17
		Benzo(a)pyrene	29000	17
		Benzo(b)fluoranthene	46000	17
		Benzo(g,h,i)perylene	14000	17
		Benzo(k)fluoranthene	11000	17
		Chrysene	31000	17
		Dibenz(a,h)anthracene	2900	17
		Fluoranthene	31000	17
		Fluorene	2100	17
		Indeno(1,2,3-cd)pyrene	15000	17
		Naphthalene	940	17
		Phenanthrene	18000	17
		Pyrene	35000	17
		Pencil pitch	3100000	170000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S by EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: 94-4007
Matrix: sedime
Received: 12/27/1994
Sampled: 12/27/1994
Prepared: 12/29/94
Analyzed: 01/02/94

Client ID	Lab ID	Analyte	Result	MRL
T41227P9	94-4007-12	Acenaphthene	3800	17
		Acenaphthylene	60	17
		Anthracene	3500	17
		Benzo(a)anthracene	21000	17
		Benzo(a)pyrene	25000	17
		Benzo(b)fluoranthene	35000	17
		Benzo(g,h,i)perylene	12000	17
		Benzo(k)fluoranthene	10000	17
		Chrysene	22000	17
		Dibenz(a,h)anthracene	3200	17
		Fluoranthene	25000	17
		Fluorene	1600	17
		Indeno(1,2,3-cd)pyrene	12000	17
		Naphthalene	680	17
		Phenanthrene	14000	17
		Pyrene	28000	17
		Pencil pitch	2500000	170000
Method Blank		Acenaphthene	ND	6.7
		Acenaphthylene	ND	6.7
		Anthracene	ND	6.7
		Benzo(a)anthracene	ND	6.7
		Benzo(a)pyrene	ND	6.7
		Benzo(b)fluoranthene	ND	6.7
		Benzo(g,h,i)perylene	ND	6.7
		Benzo(k)fluoranthene	ND	6.7
		Chrysene	ND	6.7
		Dibenz(a,h)anthracene	ND	6.7
		Fluoranthene	ND	6.7
		Fluorene	ND	6.7
		Indeno(1,2,3-cd)pyrene	ND	6.7
		Naphthalene	ND	6.7
		Phenanthrene	ND	6.7
		Pyrene	ND	6.7
		Pencil pitch	ND	67000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report.



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client:
Project: Port of Portland
T-4

NCA Project #: P501045
Matrix: soil
Received: 01/05/1995
Sampled: 01/05/1995
Prepared: 01/06/95
Analyzed: 01/11/95

Client ID	Lab ID	Analyte	Result	MRL
T40105 C4 *	P501045-1	Acenaphthene	2800	84
		Acenaphthylene	ND	84
		Anthracene	2300	84
		Benzo(a)anthracene	19000	84
		Benzo(a)pyrene	18000	84
		Benzo(b)fluoranthene	21000	84
		Benzo(g,h,i)perylene	8500	84
		Benzo(k)fluoranthene	5300	84
		Chrysene	17000	84
		Dibenz(a,h)anthracene	2100	84
		Fluoranthene	26000	84
		Fluorene	1200	84
		Indeno(1,2,3-cd)pyrene	9600	84
		Naphthalene	490	84
		Phenanthrene	10000	84
		Pyrene	23000	84
		Pencil pitch	2300000	840000

MRL
ND Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501045
Matrix: soil
Received: 01/05/1995
Sampled: 01/05/1995
Prepared: 01/06/95
Analyzed: 01/11/95

Ident ID	Lab ID	Analyte	Result	MRL
0105 C7	P501045-2	Acenaphthene	4700	34
		Acenaphthylene	530	34
		Anthracene	6400	34
		Benzo(a)anthracene	20000	34
		Benzo(a)pyrene	19000	34
		Benzo(b)fluoranthene	20000	34
		Benzo(g,h,i)perylene	12000	34
		Benzo(k)fluoranthene	7200	34
		Chrysene	20000	34
		Dibenz(a,h)anthracene	2200	34
		Fluoranthene	33000	34
		Fluorene	2000	34
		Indeno(1,2,3-cd)pyrene	11000	34
		Naphthalene	500	34
		Phenanthrene	22000	34
		Pyrene	38000	34
		Pencil pitch	3800000	340000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501045
Matrix: soil
Received: 01/05/1995
Sampled: 01/05/1995
Prepared: 01/06/95
Analyzed: 01/11/95

Client ID	Lab ID	Analyte	Result	MRL
T40105 P4	P501045-3	Acenaphthene	160	6.7
		Acenaphthylene	ND	6.7
		Anthracene	130	6.7
		Benzo(a)anthracene	900	6.7
		Benzo(a)pyrene	970	6.7
		Benzo(b)fluoranthene	1200	6.7
		Benzo(g,h,i)perylene	530	6.7
		Benzo(k)fluoranthene	400	6.7
		Chrysene	900	6.7
		Dibenzo(a,h)anthracene	140	6.7
		Fluoranthene	1400	6.7
		Fluorene	76	6.7
		Indeno(1,2,3-cd)pyrene	610	6.7
		Naphthalene	24	6.7
		Phenanthrene	600	6.7
		Pyrene	1100	6.7
		Pencil pitch	110000	67000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501045
Matrix: soil
Received: 01/05/1995
Sampled: 01/05/1995
Prepared: 01/06/95
Analyzed: 01/11/95

Client ID	Lab ID	Analyte	Result	MRL
T40105 P23	P501045-4	Acenaphthene	5500	6.7
		Acenaphthylene	150	6.7
		Anthracene	3100	6.7
		Benzo(a)anthracene	18000	6.7
		Benzo(a)pyrene	20000	6.7
		Benzo(b)fluoranthene	24000	6.7
		Benzo(g,h,i)perylene	11000	6.7
		Benzo(k)fluoranthene	7600	6.7
		Chrysene	19000	6.7
		Dibenz(a,h)anthracene	2800	6.7
		Fluoranthene	26000	6.7
		Fluorene	2000	6.7
		Indeno(1,2,3-cd)pyrene	11000	6.7
		Naphthalene	570	6.7
		Phenanthrene	18000	6.7
		Pyrene	26000	6.7
		Pencil pitch	2600000	67000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client:
Project: Port of Portland
T-4

NCA Project #: P501045
Matrix: soil
Received: 01/05/1995
Sampled: 01/05/1995
Prepared: 01/06/95
Analyzed: 01/11/95

Client ID	Lab ID	Analyte	Result	MRL
T40105 P13	P501045-5	Acenaphthene	1100	34
		Acenaphthylene	140	34
		Anthracene	900	34
		Benzo(a)anthracene	4400	34
		Benzo(a)pyrene	5300	34
		Benzo(b)fluoranthene	6300	34
		Benzo(g,h,i)perylene	2200	34
		Benzo(k)fluoranthene	1600	34
		Chrysene	4700	34
		Dibenz(a,h)anthracene	500	34
		Fluoranthene	8200	34
		Fluorene	420	34
		Indeno(1,2,3-cd)pyrene	2400	34
		Naphthalene	220	34
		Phenanthrene	3500	34
		Pyrene	8500	34
		Pencil pitch	870000	340000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501045
Matrix: soil
Received: 01/05/1995
Sampled: 01/05/1995
Prepared: 01/06/95
Analyzed: 01/16/95

Client ID	Lab ID	Analyte	Result	MRL
T40105 P22	P501045-6	Acenaphthene	16000	170
		Acenaphthylene	ND	170
		Anthracene	11000	170
		Benzo(a)anthracene	73000	170
		Benzo(a)pyrene	85000	170
		Benzo(b)fluoranthene	120000	170
		Benzo(g,h,i)perylene	22000	170
		Benzo(k)fluoranthene	18000	170
		Chrysene	84000	170
		Dibenzo(a,h)anthracene	7600	170
		Fluoranthene	110000	170
		Fluorene	6200	170
		Indeno(1,2,3-cd)pyrene	20000	170
		Naphthalene	5300	170
		Phenanthrene	42000	170
		Pyrene	96000	170
		Pencil pitch	9800000	1680000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501045
Matrix: soil
Received: 01/05/1995
Sampled: 01/05/1995
Prepared: 01/06/95
Analyzed: 01/11/95

Client ID	Lab ID	Analyte	Result	MRL
T40105 P24. -1	P501045-7	Acenaphthene	1100	34
		Acenaphthylene	280	34
		Anthracene	1200	34
		Benzo(a)anthracene	4900	34
		Benzo(a)pyrene	5600	34
		Benzo(b)fluoranthene	6100	34
		Benzo(g,h,i)perylene	1900	34
		Benzo(k)fluoranthene	1300	34
		Chrysene	4900	34
		Dibeno(a,h)anthracene	410	34
		Fluoranthene	8900	34
		Fluorene	510	34
		Indeno(1,2,3-cd)pyrene	2100	34
		Naphthalene	160	34
		Phenanthrene	5300	34
		Pyrene	10000	34
		Pencil pitch	1000000	340000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501045
Matrix: soil
Received: 01/05/1995
Sampled: 01/05/1995
Prepared: 01/06/95
Analyzed: 01/15/95

Client ID	Lab ID	Analyte	Result	MRL
T40105 P12	P501045-8	Acenaphthene	850	34
		Acenaphthylene	ND	34
		Anthracene	650	34
		Benzo(a)anthracene	5400	34
		Benzo(a)pyrene	4900	34
		Benzo(b)fluoranthene	6800	34
		Benzo(g,h,i)perylene	3700	34
		Benzo(k)fluoranthene	2300	34
		Chrysene	5800	34
		Dibenz(a,h)anthracene	1200	34
		Fluoranthene	7700	34
		Fluorene	540	34
		Indeno(1,2,3-cd)pyrene	3400	34
		Naphthalene	170	34
		Phenanthrene	4000	34
		Pyrene	7700	34
		Pencil pitch	780000	340000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501045
Matrix: soil
Received: 01/05/1995
Sampled: 01/05/1995
Prepared: 01/06/95
Analyzed: 01/15/95

Client ID	Lab ID	Analyte	Result	MRL
T40105 P10 *1	P501045-9	Acenaphthene	2600	67
		Acenaphthylene	ND	67
		Anthracene	2200	67
		Benzo(a)anthracene	17000	67
		Benzo(a)pyrene	14000	67
		Benzo(b)fluoranthene	26000	67
		Benzo(g,h,i)perylene	9000	67
		Benzo(k)fluoranthene	6700	67
		Chrysene	16000	67
		Dibeno(a,h)anthracene	3100	67
		Fluoranthene	26000	67
		Fluorene	1100	67
		Indeno(1,2,3-cd)pyrene	8200	67
		Naphthalene	440	67
		Phenanthrene	10000	67
		Pyrene	22000	67
		Pencil pitch	2200000	670000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501045
Matrix: soil
Received: 01/05/1995
Sampled: 01/05/1995
Prepared: 01/06/95
Analyzed: 01/16/95

Client ID	Lab ID	Analyte	Result	MRL
T40105 P11 *	P501045-10	Acenaphthene	1800	17
		Acenaphthylene	ND	17
		Anthracene	1500	17
		Benzo(a)anthracene	11000	17
		Benzo(a)pyrene	11000	17
		Benzo(b)fluoranthene	14000	17
		Benzo(g,h,i)perylene	5400	17
		Benzo(k)fluoranthene	5200	17
		Chrysene	12000	17
		Dibenzo(a,h)anthracene	970	17
		Fluoranthene	14000	17
		Fluorene	800	17
		Indeno(1,2,3-cd)pyrene	5200	17
		Naphthalene	340	17
		Phenanthrene	7000	17
		Pyrene	14000	17
		Pencil pitch	1500000	170000
Method Blank		Acenaphthene	ND	6.7
		Acenaphthylene	ND	6.7
		Anthracene	ND	6.7
		Benzo(a)anthracene	ND	6.7
		Benzo(a)pyrene	ND	6.7
		Benzo(b)fluoranthene	ND	6.7
		Benzo(g,h,i)perylene	ND	6.7
		Benzo(k)fluoranthene	ND	6.7
		Chrysene	ND	6.7
		Dibenzo(a,h)anthracene	ND	6.7
		Fluoranthene	ND	6.7
		Fluorene	ND	6.7
		Indeno(1,2,3-cd)pyrene	ND	6.7
		Naphthalene	ND	6.7
		Phenanthrene	ND	6.7
		Pyrene	ND	6.7
		Pencil pitch	ND	67000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb).

Client: Port of Portland
Project: T-4

NCA Project #: P501062
Matrix: soil
Received: 01/07/1995
Sampled: 01/07/1995
Prepared: 01/09/95
Analyzed: 01/16/95

Client ID	Lab ID	Analyte	Result	MRL
T4107 C6S	P501062-1	Acenaphthene	1400	51
		Acenaphthylene	110	51
		Anthracene	1600	51
		Benzo(a)anthracene	9800	51
		Benzo(a)pyrene	11000	51
		Benzo(b)fluoranthene	13000	51
		Benzo(g,h,i)perylene	7000	51
		Benzo(k)fluoranthene	4500	51
		Chrysene	10000	51
		Dibenzo(a,h)anthracene	2100	51
		Fluoranthene	16000	51
		Fluorene	620	51
		Indeno(1,2,3-cd)pyrene	6400	51
		Naphthalene	260	51
		Phenanthrene	6400	51
		Pyrene	14000	51
		Pencil pitch	1500000	510000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501062
Matrix: soil
Received: 01/07/1995
Sampled: 01/07/1995
Prepared: 01/09/95
Analyzed: 01/16/95

Client ID	Lab ID	Analyte	Result	MRL
T4107 C6B -1	P501062-2	Acenaphthene	1000	17
		Acenaphthylene	71	17
		Anthracene	1000	17
		Benzo(a)anthracene	7500	17
		Benzo(a)pyrene	8200	17
		Benzo(b)fluoranthene	10000	17
		Benzo(g,h,i)perylene	3800	17
		Benzo(k)fluoranthene	4100	17
		Chrysene	6600	17
		Dibenz(a,h)anthracene	1500	17
		Fluoranthene	12000	17
		Fluorene	480	17
		Indeno(1,2,3-cd)pyrene	3900	17
		Naphthalene	210	17
		Phenanthrene	4500	17
		Pyrene	10000	17
		Pencil pitch	1000000	170000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501062
Matrix: soil
Received: 01/07/1995
Sampled: 01/07/1995
Prepared: 01/09/95
Analyzed: 01/16/95

Client ID	Lab ID	Analyte	Result	MRL
T4107 C5B	P501062-3	Acenaphthene	150	17
		Acenaphthylene	42	17
		Anthracene	100	17
		Benzo(a)anthracene	560	17
		Benzo(a)pyrene	580	17
		Benzo(b)fluoranthene	920	17
		Benzo(g,h,i)perylene	380	17
		Benzo(k)fluoranthene	210	17
		Chrysene	600	17
		Dibenz(a,h)anthracene	98	17
		Fluoranthene	960	17
		Fluorene	100	17
		Indeno(1,2,3-cd)pyrene	330	17
		Naphthalene	50	17
		Phenanthrene	540	17
		Pyrene	1200	17
		Pencil pitch	ND	170000

MRL Method Reporting Level
ND None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

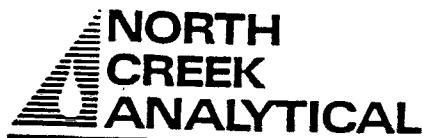
Client:
Project: Port of Portland
T-4

NCA Project #: P501062
Matrix: soil
Received: 01/07/1995
Sampled: 01/07/1995
Prepared: 01/09/95
Analyzed: 01/16/95

Client ID	Lab ID	Analyte	Result	MRL
T40107 P21 *1	P501062-4	Acenaphthene	310	14
		Acenaphthylene	42	14
		Anthracene	220	14
		Benz(a)anthracene	620	14
		Benzo(a)pyrene	510	14
		Benzo(b)fluoranthene	800	14
		Benzo(g,h,i)perylene	290	14
		Benzo(k)fluoranthene	200	14
		Chrysene	580	14
		Dibenzo(a,h)anthracene	84	14
		Fluoranthene	1100	14
		Fluorene	270	14
		Indeno(1,2,3-cd)pyrene	270	14
		Naphthalene	60	14
		Phenanthrene	1400	14
		Pyrene	1400	14
		Pencil pitch	ND	140000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501062
Matrix: soil
Received: 01/07/1995
Sampled: 01/07/1995
Prepared: 01/09/95
Analyzed: 01/17/95

Client ID	Lab ID	Analyte	Result	MRL
T40107 P20	P501062-5	Acenaphthene	1000	34
		Acenaphthylene	ND	34
		Anthracene	840	34
		Benzo(a)anthracene	6200	34
		Benzo(a)pyrene	6000	34
		Benzo(b)fluoranthene	8900	34
		Benzo(g,h,i)perylene	4000	34
		Benzo(k)fluoranthene	2400	34
		Chrysene	7300	34
		Dibenzo(a,h)anthracene	1200	34
		Fluoranthene	9100	34
		Fluorene	440	34
		Indeno(1,2,3-cd)pyrene	3600	34
		Naphthalene	200	34
		Phenanthrene	4200	34
		Pyrene	8200	34
		Pencil pitch	840000	340000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501062
Matrix: soil
Received: 01/07/1995
Sampled: 01/07/1995
Prepared: 01/09/95
Analyzed: 01/17/95

Client ID	Lab ID	Analyte	Result	MRL
T40107 P19	P501062-6	Acenaphthene	1700	34
		Acenaphthylene	ND	34
		Anthracene	1400	34
		Benzo(a)anthracene	10000	34
		Benzo(a)pyrene	8900	34
		Benzo(b)fluoranthene	14000	34
		Benzo(g,h,i)perylene	5600	34
		Benzo(k)fluoranthene	3900	34
		Chrysene	10000	34
		Dibenzo(a,h)anthracene	2000	34
		Fluoranthene	15000	34
		Fluorene	670	34
		Indeno(1,2,3-cd)pyrene	5000	34
		Naphthalene	300	34
		Phenanthrene	6900	34
		Pyrene	13000	34
		Pencil pitch	1300000	340000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501062
Matrix: soil
Received: 01/07/1995
Sampled: 01/07/1995
Prepared: 01/09/95
Analyzed: 01/17/95

Client ID	Lab ID	Analyte	Result	MRL
T40107 P16	P501062-9	Acenaphthene	530	34
		Acenaphthylene	ND	34
		Anthracene	420	34
		Benzo(a)anthracene	4200	34
		Benzo(a)pyrene	3200	34
		Benzo(b)fluoranthene	4600	34
		Benzo(g,h,i)perylene	2100	34
		Benzo(k)fluoranthene	1300	34
		Chrysene	4000	34
		Dibenz(a,h)anthracene	630	34
		Fluoranthene	4200	34
		Fluorene	230	34
		Indeno(1,2,3-cd)pyrene	1900	34
		Naphthalene	120	34
		Phenanthrene	2100	34
		Pyrene	5600	34
		Pencil pitch	560000	340000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501062
Matrix: soil
Received: 01/07/1995
Sampled: 01/07/1995
Prepared: 01/09/95
Analyzed: 01/17/95

Client ID	Lab ID	Analyte	Result	MRL
T40107 P14	P501062-10	Acenaphthene	220	34
		Acenaphthylene	ND	34
		Anthracene	160	34
		Benzo(a)anthracene	1200	34
		Benzo(a)pyrene	1100	34
		Benzo(b)fluoranthene	1500	34
		Benzo(g,h,i)perylene	670	34
		Benzo(k)fluoranthene	520	34
		Chrysene	1200	34
		Dibenzo(a,h)anthracene	190	34
		Fluoranthene	1500	34
		Fluorene	69	34
		Indeno(1,2,3-cd)pyrene	600	34
		Naphthalene	69	34
		Phenanthrene	930	34
		Pyrene	2100	34
		Pencil pitch	ND	340000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report



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PAH'S per EPA 8270 - Modified GC/MS in SIM Mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4

NCA Project #: P501062
Matrix: soil
Received: 01/07/1995
Sampled: 01/07/1995
Prepared: 01/09/95
Analyzed: 01/17/95

Client ID	Lab ID	Analyte	Result	MRL
T40107 P17	P501062-11	Acenaphthene	1400	34
		Acenaphthylene	ND	34
		Anthracene	1100	34
		Benzo(a)anthracene	8000	34
		Benzo(a)pyrene	9100	34
		Benzo(b)fluoranthene	9800	34
		Benzo(g,h,i)perylene	5300	34
		Benzo(k)fluoranthene	4000	34
		Chrysene	7800	34
		Dibenzo(a,h)anthracene	1700	34
		Fluoranthene	11000	34
		Fluorene	580	34
		Indeno(1,2,3-cd)pyrene	5100	34
		Naphthalene	240	34
		Phenanthrene	5300	34
		Pyrene	9800	34
		Pencil pitch	1000000	340000
Method Blank		Acenaphthene	ND	6.7
		Acenaphthylene	ND	6.7
		Anthracene	ND	6.7
		Benzo(a)anthracene	ND	6.7
		Benzo(a)pyrene	ND	6.7
		Benzo(b)fluoranthene	ND	6.7
		Benzo(g,h,i)perylene	ND	6.7
		Benzo(k)fluoranthene	ND	6.7
		Chrysene	ND	6.7
		Dibenzo(a,h)anthracene	ND	6.7
		Fluoranthene	ND	6.7
		Fluorene	ND	6.7
		Indeno(1,2,3-cd)pyrene	ND	6.7
		Naphthalene	ND	6.7
		Phenanthrene	ND	6.7
		Pyrene	ND	6.7
		Pencil pitch	ND	67000

MRL
ND

Method Reporting Level
None Detected at or above the method reporting level
See Comment Section at end of report

02/07/95 15.18 503 731 7313
001-1500 12:22PM FROM

POP-ENGINEERING

TO

006-013

7317313 P.86

Pencil Pitch by EPA 8270 - Modified GC/MS in SIM mode
Results In ug/kg (ppb)

Client: Port of Portland
Project: T-4
Received: 01/26/1995

NCA Number: P501277
Matrix: sludge

Sample Name	Analyte	Result	MRL
T40126P22AR *1	Pencil Pitch	1300000	16000
	Date Prepped	01/27/95	
	Date Analyzed	01/31/95	
40126P22BR *1	Pencil Pitch	2400000	17000
	Date Prepped	01/27/95	
	Date Analyzed	01/31/95	
10126P22CR *1	Pencil Pitch	2000000	21000
	Date Prepped	01/27/95	
	Date Analyzed	01/31/95	
Method Blank	Pencil Pitch	ND	670

PRELIMINARY REPORT
This report has not yet been
reviewed by the NCA Quality
Control Dept. Results are
subject to final review.

MR_ Method Reporting Level
ND None Detected at or above the method reporting level
See Comment Section at end of report

875-1

APPENDIX A-2

SEDIMENT CHEMISTRY DATA

SITE 6 - MOBIL OIL BULK PLANT

TABLE 8-1
 SUMMARY OF ANALYTICAL RESULTS
 FOR BEACH SAMPLING
 INTERIM DATA SUMMARY REPORT
 MOBIL OIL TERMINAL
 PORTLAND, OREGON

Compound	CONCENTRATION SAMPLE NUMBER						
	S-SS1-0 mg/kg	S-SS2-0 mg/kg	S-SS2-1 mg/kg	S-SS3-0 mg/kg	S-SS3-1 mg/kg	S-SS4-0 mg/kg	W-SD-01 ug/L
Petroleum Hydrocarbons	470	33	58	140	4200	2200	-
Benzene	-	-	-	-	-	0.24	910
Toluene	-	-	-	-	-	0.13	16
Ethylbenzene	-	-	-	-	-	0.34	30
Xylenes (Total)	-	-	-	-	-	1.0	27
Fuel Hydrocarbons	-	-	-	-	-	2500 (Diesel)	

KEY:

W-SD-01: Water sample collected from abandoned storm drain

--: Not Analyzed

See report text for analytical methods

APPENDIX A-3

SEDIMENT CHEMISTRY DATA

SITE 7 - U.S. COE — PORTLAND MOORINGS

SITE ID: 1641

US Army COE - Portland Moorings

SITE SUMMARY REPORT

<u>SUBSTANCE</u>	<u>MEDIA CONTAMINATED</u>	<u>CONCENTRATION LEVEL</u>	<u>EVIDENCE</u>	<u>OBSERV. DATE</u>
ACENAPHTHENE	Sediment Date released: unk Quantity Released: unk	9.4 ppm	Laboratory Data	12-OCT-89
ANTHRACENE	Sediment Date released: unk Quantity Released: unk	5.5 ppm	Laboratory Data	12-OCT-89
ARSENIC	Sediment Date released: unk Quantity Released: unk	60 ppm	Laboratory Data	20-DEC-94
BENZO(a)ANTHRACENE	Sediment Date released: unk Quantity Released: unk	4.7 ppm	Laboratory Data	12-OCT-89
BENZO(a)PYRENE	Sediment Date released: unk Quantity Released: unk	5.5 ppm	Laboratory Data	12-OCT-89
190 BENZO(b)FLUORANTHENE	Sediment Date released: unk Quantity Released: unk	6.8 ppm	Laboratory Data	12-OCT-89
1 BENZO(ghi)PERYLENE	Sediment Date released: unk Quantity Released: unk	5.7 ppm	Laboratory Data	12-OCT-89
CHROMIUM	Sediment Date released: unk Quantity Released: unk	87 ppm	Laboratory Data	20-DEC-94
CHRYSENE	Sediment Date released: unk Quantity Released: unk	5.9 ppm	Laboratory Data	12-OCT-89
COPPER	Sediment Date released: unk Quantity Released: unk	140 ppm	Laboratory Data	20-DEC-94
DDD,p,p'	Sediment Date released: unk Quantity Released: unk	0.47 ppm	Laboratory Data	12-OCT-89
DDT,p,p'	Sediment Date released: unk	0.2 ppm	Laboratory Data	12-OCT-89

SITE ID: 1641 US Army COE - Portland Moorings

SITE SUMMARY REPORT

	Quantity Released: unk	Laboratory Data	
DIBENZO(a,h)ANTHRACENE	Sediment 0.83 ppm Date released: unk Quantity Released: unk	Laboratory Data	12-OCT-89
DIBENZOFURAN	Sediment 0.77 ppm Date released: unk Quantity Released: unk	Laboratory Data	12-OCT-89
DIELDRIN	Sediment 0.029 ppm Date released: unk Quantity Released: unk	Laboratory Data	12-OCT-89
FLUORANTHENE	Sediment 20 ppm Date released: unk Quantity Released: unk	Laboratory Data	12-OCT-89
FLUORENE	Sediment 5.3 ppm Date released: unk Quantity Released: unk	Laboratory Data	12-OCT-89
INDENO(1,2,3-cd)PYRENE	Sediment 3.9 ppm Date released: unk Quantity Released: unk	Laboratory Data	12-OCT-89
LEAD	Sediment 335 ppm Date released: unk Quantity Released: unk	Laboratory Data	12-OCT-89
NAPHTHALENE	Sediment 21 ppm Date released: unk Quantity Released: unk	Laboratory Data	12-OCT-89
PCBs	Soil 0.6 ppm Date released: unk Quantity Released: unk	Laboratory Data	11-FEB-93
PETROLEUM HYDROCARBONS	Soil 2,400 ppm Date released: unk Quantity Released: unk Sample Depth: 0.5 ft.	Laboratory Data	29-SEP-92
PHENANTHRENE	Sediment 29 ppm Date released: unk Quantity Released: unk	Laboratory Data	12-OCT-89
PYRENE	Sediment 27 ppm Date released: unk Quantity Released: unk	Laboratory Data	12-OCT-89

SITE ID: 1641 US Army COE - Portland Moorings

SITE SUMMARY REPORT

TIN	Sediment 0.24 ppm Date released: unk Quantity Released: unk General Comments: (Tributyl tin)	Laboratory Data 14-JUN-94
ZINC	Sediment 638 ppm Date released: unk Quantity Released: unk	Laboratory Data 20-DEC-94

ENVIRONMENTAL/HEALTH THREATS:

390

Sediment contamination in the Willamette River adjacent to the site is likely to be toxic to benthic organisms, bottom-feeding fish, and possibly anadromous fish that migrate through this area. Because DEQ has no data on contaminants dissolved or suspended in surface water, it is not clear how significant an effect this sediment contamination may have on migrating fish.

INVESTIGATIVE, REMEDIAL, AND ADMINISTRATIVE ACTIONS

ACTION	START DATE	COMPL. DATE	RESP. STAFF	AGENCY CODE	REGION	LEAD PROGRAM
Site added to CERCLIS	05-FEB-93	05-FEB-93		EPA		
EPA Basic Preliminary Assessment COMMENTS: (Prepared for EPA by ACOE Portland District.)	28-SEP-93	20-APR-94		EPA		
Site added to database	27-DEC-94		Dan Crouse	DEQ	HQ	SAS
Site Screening recommended (EV)	10-APR-95	10-APR-95	Dan Crouse	DEQ	HQ	SAS
EPA Screening Site Inspection 1	21-MAY-95	22-MAY-95		EPA		
No Further Remedial Action Planned under Federal program	22-MAY-95	22-MAY-95		EPA		
PRELIMINARY ASSESSMENT EQUIVALENT	17-DEC-96		Gil Wistar	DEQ	NW	SAS

Summary of Sediment Samples with Elevated Contaminant Levels, 1988 - 1994, U. S. Moorings Site

SAMPLE INFORMATION				ANALYTICAL RESULTS (ppm, unless noted otherwise)			
Sample No./ Map Location	Media	Date	Analyses Conducted	Total Metals	PAHs	PCBs and Pesticides	Other Compounds
880684 X422 (not shown on map - part of DEQ Willamette River Study, from foot of St. Johns Bridge)	river sediment	8/10/88	total metals PAHs PCBs/pesticides <i>Microtox bioassay</i>	As - 45.5 Zn - 159	acenaphthene - <200 anth - 4 benz(a)anth - 5 benz(a)py - 6 benz(b&k)fluor - 10 benz(ghi)peryl - 9 chrys - 6 dibenz(a,h)anth - 10 fluoranth - 20 fluorene - <30 indeno - 6 naphth - <100 phenanth - 10 pyrene - <10	PCB 1260 - 0.35 DDD - 0.035 DDE - 0.006 DDT - 0.006	<i>Results of Microtox bioassay: sediment considered toxic to test organisms (marine bacteria)</i>
M-1 (map #1)	river sediment	10/12/89	total metals PAHs PCBs/pesticides phthalates/phenols dioxins (composite of M-1, -2, and -3)	Pb - 335 Zn - 183	acenaphthene - 9.4 anth - 5.5 benz(a)anth - 4.7 benz(a)py - 5.5 benz(b&k)fluor - 6.8 benz(ghi)peryl - 5.7 chrys - 5.9 dibenz(a,h)anth - 0.76 dibenzofuran - 0.77 fluoranth - 20 fluorene - 5.3 indeno - 3.9 naphth - 21 phenanth - 29 pyrene - 27	DDD - 0.13 DDT - 0.04 dieldrin - 0.011	dioxins - 7.76 parts per trillion TEF (composite of M-1, - 2, -3)

SAMPLE INFORMATION				ANALYTICAL RESULTS (ppm, unless noted otherwise)			
Sample No./ Map Location	Media	Date	Analyses Conducted	Total Metals	PAHs	PCBs and Pesticides	Other Compounds
M-2 (map #2)	river sediment	10/12/89	(same as M-1)	Pb - 331 Zn - 158	acenaphthene - 8.5 anth - 5.4 benz(a)anth - 3.6 benz(a)py - 4.1 benz(b&k)fluor - 4.9 benz(ghi)peryl - 3 chrys - 4.8 dibenzofuran - 0.75 fluoranth - 13 fluorene - 4.6 indeno - 2.4 naphth - 0.55 phenanth - 23 pyrene - 19	DDD - 0.11 DDT - 0.035 dieldrin - 0.011	dioxins - 7.76 parts per trillion TEF (composite of M-1, -2, -3)
M-3 (map #3)	river sediment	10/12/89	(same as M-1)	Hg - 0.429	acenaphthene - 4.5 anth - 5.4 benz(a)anth - 4.4 benz(a)py - 4.6 benz(b&k)fluor - 5.7 benz(ghi)peryl - 4.9 chrys - 5.3 dibenz(a,h)anth - 0.83 dibenzofuran - 0.56 fluoranth - 12 fluorene - 3.9 indeno - 3.2 naphth - 0.84 phenanth - 21 pyrene - 20	DDD - 0.47 DDT - 0.2 dieldrin - 0.029	dioxins - 7.76 parts per trillion TEF (composite of M-1, -2, -3)
M-P-1 (map #21)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)		acenaphthene - 0.17 anth - 0.81 benz(a)anth - 2.5 benz(a)py - 2.5 benz(b&k)fluor - 4.5 benz(ghi)peryl - 1.5 chrys - 3.1 dibenz(a,h)anth - 0.33 fluoranth - 6 fluorene - 0.6 indeno - 2.3 naphth - 0.17 phenanth - 4.2 pyrene - 6.4	TBT - 0.11 bis(2-ethylhexyl) phthalate - 0.52	

S9C

SAMPLE INFORMATION				ANALYTICAL RESULTS (ppm, unless noted otherwise)			
Sample No./ Map Location	Media	Date	Analyses Conducted	Total Metals	PAHs	PCBs and Pesticides	Other Compounds
M-P-2 (map #22)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)		acenaphthene - 0.17 anth - 0.86 benz(a)anth - 2 benz(a)py - 2.3 benz(b&k)fluor - 3.5 benz(ghi)peryl - 1.4 chrys - 2.3 dibenz(a,h)anth - 0.34 fluoranth - 5.1 fluorene - 0.47 indeno - 2.1 naphth - 0.18 phenanth - 4.4 pyrene - 5.6	DDT - 0.02	TBT - 0.052 bis(2-ethylhexyl) phthalate - 0.36
M-P-3 (map #23)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)	As - 6.7 Cr - 44.2 Pb - 86.9	acenaphthene - 0.35 anth - 1.2 benz(a)anth - 4.2 benz(a)py - 4.6 benz(b&k)fluor - 7.6 benz(ghi)peryl - 3 chrys - 4.7 dibenz(a,h)anth - 0.73 dibenzofuran - 0.18 fluoranth - 11 fluorene - 0.64 indeno - 4.9 naphth - 0.32 phenanth - 5.1 pyrene - 11		TBT - 0.41 bis(2-ethylhexyl) phthalate - 0.43
M-P-4 (map #24)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT) dioxins/furans		acenaphthene - 0.19 anth - 0.89 benz(a)anth - 2.4 benz(a)py - 3 benz(b&k)fluor - 4.6 benz(ghi)peryl - 1.8 chrys - 2.8 dibenz(a,h)anth - 0.47 dibenzofuran - 0.086 fluoranth - 5.8 fluorene - 0.3 indeno - 2.8 naphth - 0.28 phenanth - 2.8 pyrene - 6	DDT - 0.04	TBT - 0.15 bis(2-ethylhexyl) phthalate - 0.4 dioxins detected; TEF not calculated

SAMPLE INFORMATION				ANALYTICAL RESULTS (ppm, unless noted otherwise)			
Sample No./ Map Location	Media	Date	Analyses Conducted	Total Metals	PAHs	PCBs and Pesticides	Other Compounds
M-P-5 (map #25)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT) dioxins/furans		acenaphthene - 0.12 anth - 0.56 benz(a)anth - 1.8 benz(a)py - 2.1 benz(b&k)fluor - 3.3 benz(ghi)peryl - 1.1 chrys - 2.1 dibenz(a,h)anth - 0.33 dibenzofuran - 0.12 fluoranth - 4.5 fluorene - 0.31 indeno - 1.9 naphth - 0.15 phenanth - 2.3 pyrene - 4.5	DDT - 0.07	TBT - 0.093 bis(2-ethylhexyl) phthalate - 0.38 dioxins detected; TEF not calculated
M-P-6 (map #26)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT) dioxins/furans		acenaphthene - 0.096 anth - 0.42 benz(a)anth - 1.4 benz(a)py - 1.9 benz(b&k)fluor - 2.6 benz(ghi)peryl - 0.93 chrys - 1.6 dibenz(a,h)anth - 0.23 dibenzofuran - 0.067 fluoranth - 3 fluorene - 0.18 indeno - 1.6 naphth - 0.13 phenanth - 1.5 pyrene - 3.2	DDT - 0.2	TBT - 0.13 bis(2-ethylhexyl) phthalate - 0.35 dioxins detected; TEF not calculated
M-P-7 (map #27)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)		acenaphthene - 0.077 anth - 0.4 benz(a)anth - 1.1 benz(a)py - 1.6 benz(b&k)fluor - 2.2 benz(ghi)peryl - 1.1 chrys - 1.2 dibenz(a,h)anth - 0.3 fluoranth - 2.4 fluorene - 0.12 indeno - 1.7 naphth - 0.092 phenanth - 1.2 pyrene - 2.7	DDT - 0.05	TBT - 0.2 bis(2-ethylhexyl) phthalate - 0.28

SAMPLE INFORMATION				ANALYTICAL RESULTS (ppm, unless noted otherwise)			
Sample No./ Map Location	Media	Date	Analyses Conducted	Total Metals	PAHs	PCBs and Pesticides	Other Compounds
M-P-8/9 (composite) (map #28)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)		acenaphthene - 0.088 anth - 0.32 benz(a)anth - 1.3 benz(a)py - 1.7 benz(b&k)fluor - 2.4 benz(ghi)peryl - 0.79 chrys - 1.4 dibenz(a,h)anth - 0.24 dibenzofuran - 0.051 fluoranth - 2.4 fluorene - 0.14 indeno - 1.5 naphth - 0.11 phenanth - 1.2 pyrene - 2.6	DDT - 0.03	TBT - 0.24 bis(2-ethylhexyl) phthalate - 0.34
M-P-10/12 (composite) (map #29)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)	Cr - 56.4 Cd - 0.55	acenaphthene - 0.053 anth - 0.42 benz(a)anth - 2.2 benz(a)py - 2.7 benz(b&k)fluor - 4.3 benz(ghi)peryl - 1.1 chrys - 2.1 dibenz(a,h)anth - 0.5 dibenzofuran - 0.11 fluoranth - 3.5 fluorene - 0.22 indeno - 2.3 naphth - 0.099 phenanth - 1.7 pyrene - 3.4		TBT - 0.16 bis(2-ethylhexyl) phthalate - 0.46
M-P-11/13 (composite) (map #30)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)		anth - 0.21 benz(a)anth - 0.91 benz(a)py - 1.2 benz(b&k)fluor - 1.8 benz(ghi)peryl - 0.51 chrys - 1 dibenz(a,h)anth - 0.18 fluoranth - 1.8 fluorene - 0.11 indeno - 1 naphth - 0.065 phenanth - 0.89 pyrene - 1.7	DDT - 0.03	TBT - 0.085 bis(2-ethylhexyl) phthalate - 0.31

SAMPLE INFORMATION				ANALYTICAL RESULTS (ppm, unless noted otherwise)			
Sample No./ Map Location	Media	Date	Analyses Conducted	Total Metals	PAHs	PCBs and Pesticides	Other Compounds
M-P-14/16 (composite) (map #31)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)		acenaphthene - 0.072 anth - 0.26 benz(a)anth - 1 benz(a)py - 1.3 benz(b&k)fluor - 1.9 benz(ghi)peryl - 0.6 chrys - 1.2 dibenz(a,h)anth - 0.19 dibenzofuran - 0.072 fluoranth - 2.1 fluorene - 0.15 indeno - 1.1 naphth - 0.091 phenanth - 0.98 pyrene - 2.1	DDT - 0.04	TBT - 0.15 bis(2-ethylhexyl) phthalate - 0.37
M-P-15 (map #32)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT) dioxins/furans		acenaphthene - 0.099 anth - 0.92 benz(a)anth - 3.3 benz(a)py - 2.2 benz(b&k)fluor - 4.4 benz(ghi)peryl - 0.76 chrys - 3.5 dibenz(a,h)anth - 0.23 fluoranth - 12 fluorene - 1.3 indeno - 1.5 naphth - 0.12 phenanth - 6.5 pyrene - 9.2		TBT - 0.11 bis(2-ethylhexyl) phthalate - 0.34 dioxins detected; TEF not calculated
M-P-17/18 (composite) (map #33)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)		acenaphthene - 0.055 anth - 0.5 benz(a)anth - 0.96 benz(a)py - 1.2 benz(b&k)fluor - 1.8 benz(ghi)peryl - 0.51 chrys - 1.1 dibenz(a,h)anth - 0.09 dibenzofuran - 0.06 fluoranth - 2.2 fluorene - 0.15 indeno - 9.9 naphth - 0.1 phenanth - 1 pyrene - 2.4	DDT - 0.03	TBT - 0.087 bis(2-ethylhexyl) phthalate - 0.28

SAMPLE INFORMATION				ANALYTICAL RESULTS (ppm, unless noted otherwise)			
Sample No./ Map Location	Media	Date	Analyses Conducted	Total Metals	PAHs	PCBs and Pesticides	Other Compounds
M-P-19/20 (composite) (map #34)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)		anth - 0.16 benz(a)anth - 0.63 benz(a)py - 0.78 benz(b&k)fluor - 1.2 benz(ghi)peryl - 0.37 chrys - 0.73 dibenz(a,h)anth - 0.06 fluoranth - 1.4 fluorene - 0.092 indeno - 0.63 naphth - 0.061 phenanth - 0.64 pyrene - 1.5		TBT - 0.09 bis(2-ethylhexyl) phthalate - 0.34
M-P-21 (map #35)	river sediment	6/14/94	total metals PAHs PCBs/pesticides phthalates/phenols tributyl tin (TBT)		acenaphthene - 0.12 anth - 0.42 benz(a)anth - 1.3 benz(a)py - 1.8 benz(b&k)fluor - 2.6 benz(ghi)peryl - 1 chrys - 1.5 dibenz(a,h)anth - 0.19 dibenzo furan - 0.076 fluoranth - 3.5 fluorene - 0.21 indeno - 2.2 naphth - 0.15 phenanth - 1.7 pyrene - 1		TBT - 0.094 bis(2-ethylhexyl) phthalate - 0.45
10 (map #38)	river sediment	12/20/94	total metals	As - 60 Cr - 87 Cu - 140 Pb - 100 Zn - 638			
11/12 (QA duplicates (map #39)	river sediment	12/20/94	total metals				
13 (map #40)	river sediment	12/20/94	total metals				
14 (map #41)	river sediment	12/20/94	total metals				
15 (map #42)	river sediment	12/20/94	total metals	Cr - 130			
16 (map #43)	river sediment	12/20/94	total metals				
17 (map #44)	river sediment	12/20/94	total metals				
18 (map #45)	river sediment	12/20/94	total metals				

TABLE 5 (con't): High Weight Polynuclear Aromatic Hydrocarbon Data

location	site	date	benzo-anthracene	benzofluoranthene	benzo-perylene	benzo-chrysene	dibenz-anthracene	inden-pyrene	fluoranthene	pyrene	total bahe	dibenzo-furan	
CORE 1	M-ICS-1DP	17-May-95	1,800	2,930	1,850	1,950	1,850	350	1,750	4,650	5,150	22,300	<300
	M-ICS-1A	17-May-95	3,080	5,130	3,080	3,330	3,180	600	2,980	7,910	8,560	32,720	600
CORE 2	M-ICS-2DP	17-May-95	630	1,170	830	680	780	<300	730	1,650	1,940	8,410	<300
	M-ICS-2A	17-May-95	1,340	2,040	1,690	1,340	1,590	<300	1,390	5,370	5,970	20,730	650
	M-ICS-2B	17-May-95	2,340	3,080	2,440	2,090	2,740	350	1,940	8,410	9,950	33,340	350
	M-ICS-2C	17-May-95	3,830	5,080	3,830	3,880	4,330	500	3,230	13,800	16,500	54,980	<300
CORE 3	M-ICS-3DP	17-May-95	2,520	4,760	3,300	2,370	3,110	490	2,960	7,280	8,350	35,340	<300
	M-ICS-3DP/QA	17-May-95	1,890	3,150	2,240	1,820	2,040	360	2,050	4,960	5,520	24,030	330
	M-ICS-3A	17-May-95	5,970	7,630	5,260	4,450	6,640	810	4,450	17,600	21,800	74,610	1,470
	M-ICS-3B	17-May-95	9,350	11,900	8,700	9,300	9,900	1,350	7,450	28,200	35,000	121,350	1,050
	M-ICS-3C	17-May-95	2,500	4,750	3,000	2,050	3,550	400	2,650	6,850	8,700	34,450	<300
CORE 4	M-ICS-4DP	17-May-95	940	1,630	1,040	1,040	1,140	<300	940	2,770	2,920	12,420	<300
	M-ICS-4A	17-May-95	5,170	5,470	3,320	3,410	5,610	590	3,070	16,400	21,000	64,040	390
	M-ICS-4B	17-May-95	2,340	2,880	1,590	1,490	2,990	<300	1,340	6,570	8,410	27,610	<300
	M-ICS-4C	17-May-95	2,340	2,330	1,340	1,390	3,030	<300	1,000	5,720	8,110	25,260	<300
CORE 5	M-ICS-5DP	17-May-95	2,520	4,260	2,080	1,880	3,120	<300	1,830	6,680	6,780	33,410	350
	M-ICS-5A	17-May-95	3,730	5,820	3,130	3,180	4,380	400	2,850	10,600	11,300	45,430	700
	M-ICS-5B	17-May-95	5,900	10,450	6,550	5,300	7,650	850	6,000	15,900	19,600	78,200	<300
	M-ICS-5C	17-May-95	4,090	5,510	3,550	3,650	4,730	540	3,300	13,600	17,000	55,970	1,330
CORE 6	M-ICS-6DP	17-May-95	26,400	34,600	18,300	20,300	26,300	2,600	18,200	95,900	119,000	361,600	780
	M-ICS-6A	17-May-95	5,850	10,240	5,320	6,290	6,150	1,020	6,000	17,600	19,100	77,570	1,020
	M-ICS-6B	17-May-95	8,710	11,000	6,170	7,560	10,400	1,190	6,320	19,100	25,400	95,050	800
	M-ICS-6C	17-May-95	6,900	10,290	5,370	6,500	7,830	840	5,670	22,600	26,800	92,800	590
CORE 7	M-ICS-7DP	17-May-95	44,200	70,300	39,000	39,100	46,000	7,070	40,900	122,000	141,000	549,570	3,120
	M-ICS-7DP/QA	17-May-95	16,000	27,100	18,600	13,500	18,100	2,970	17,500	46,100	51,700	211,570	1,090
CORE 8	M-ICS-8DP	17-May-95	2,980	3,560	2,290	2,730	3,410	490	2,100	8,050	10,800	36,410	<300
	M-ICS-8DP/QA	17-May-95	15,000	17,370	11,200	14,600	15,000	2,100	10,600	39,300	50,000	175,170	880
	M-ICS-8A	17-May-95	15,400	19,560	11,900	16,500	16,000	1,490	10,600	56,100	68,600	216,190	1,490
	M-ICS-8B	17-May-95	12,800	16,070	9,030	13,300	13,400	1,070	8,450	47,000	57,700	178,820	1,310
	M-ICS-8C	17-May-95	8,620	13,400	8,470	10,600	8,920	940	7,930	30,300	36,900	126,080	<300
CORE 9	M-ICS-9DP	17-May-95	6,170	6,410	2,840	4,330	7,260	400	2,590	17,900	22,300	70,200	700
	M-ICS-9DP/QA	17-May-95	6,230	7,650	5,340	6,650	6,600	1,100	4,970	22,000	26,600	87,140	1,620
	M-ICS-9A	17-May-95	41,300	43,800	19,100	34,700	41,200	3,120	18,400	148,000	175,000	524,620	4,850
CORE 10	M-ICS-10DP	17-May-95	9,710	12,400	6,570	7,790	11,200	880	6,370	37,600	43,400	135,920	13,900
	M-ICS-10A	17-May-95	950	1,500	850	850	1,340	<300	700	4,530	5,170	15,890	<300
	M-ICS-10B	17-May-95	22,400	32,800	17,700	17,300	25,700	2,240	17,200	81,600	90,300	307,240	2,290
	M-ICS-10C	17-May-95	10,300	13,620	8,910	10,600	10,700	1,530	8,810	39,000	45,400	148,870	1,290
CORE 12	M-ICS-12DP upper	17-May-95	4,290	6,760	2,670	3,950	4,710	380	2,570	10,100	10,600	46,030	330
	M-ICS-12DP lower	17-May-95	6,350	8,130	5,710	6,750	6,750	1,080	5,270	17,500	22,000	79,540	390
	M-ICS-12A	17-May-95	10,100	11,740	6,230	8,990	11,000	820	5,750	34,300	40,800	129,730	820
	M-ICS-12B	17-May-95	7,920	11,510	8,730	9,390	8,400	1,180	7,780	33,500	37,000	125,410	570
	M-ICS-12C	17-May-95	6,240	8,710	6,080	6,460	7,610	860	5,220	26,800	31,600	100,280	1,000

TABLE 5: Low Weight Polynuclear Aromatic Hydrocarbon Data

location	site	date	2-methyl-naphthalene	acenaph-threne	acenaph-thylene	anthracene	fluorene	naphthalene	phenanthrene	total lpahs
CORE 1	M-ICS-1DP	17-May-95	<300	900	<300	600	600	550	3,950	6,600
	M-ICS-1A	17-May-95	500	2,340	<300	1,490	1,490	1,040	8,710	15,570
CORE 2	M-ICS-2DP	17-May-95	<300	440	<300	<300	<300	340	1,460	2,240
	M-ICS-2A	17-May-95	1,990	3,880	<300	1,640	2,090	3,680	10,300	23,580
	M-ICS-2B	17-May-95	4,180	3,480	<300	2,790	2,890	2,640	17,700	33,680
	M-ICS-2C	17-May-95	3,980	4,530	<300	3,630	2,690	4,780	20,000	39,610
CORE 3	M-ICS-3DP	17-May-95	<300	1,070	<300	1,120	870	580	6,020	9,660
	M-ICS-3DP/QA	17-May-95	400	1,220	120	720	990	760	5,270	9,480
	M-ICS-3A	17-May-95	21,600	8,480	330	6,260	6,730	2,270	38,400	84,070
	M-ICS-3B	17-May-95	25,600	8,550	550	7,750	7,100	3,700	42,700	95,950
	M-ICS-3C	17-May-95	400	550	<300	900	450	550	4,500	7,350
CORE 4	M-ICS-4DP	17-May-95	<300	350	<300	350	<300	<300	1,880	2,580
	M-ICS-4A	17-May-95	3,950	4,000	<300	5,170	3,610	3,270	31,000	51,000
	M-ICS-4B	17-May-95	2,540	1,790	<300	1,940	1,590	1,040	13,700	22,600
	M-ICS-4C	17-May-95	3,380	1,790	<300	2,190	1,940	1,140	15,600	26,040
CORE 5	M-ICS-5DP	17-May-95	<300	1,090	<300	790	790	540	5,150	8,360
	M-ICS-5A	17-May-95	2,290	2,190	<300	1,890	1,940	1,040	11,800	21,150
	M-ICS-5B	17-May-95	750	1,250	<300	2,450	1,150	750	12,200	18,550
	M-ICS-5C	17-May-95	3,050	3,400	<300	3,740	3,450	1,180	19,200	34,020
CORE 6	M-ICS-6DP	17-May-95	2,600	2,840	1,320	12,200	4,070	1,570	83,800	108,400
	M-ICS-6A	17-May-95	3,900	3,410	<300	2,780	2,680	1,460	15,000	29,230
	M-ICS-6B	17-May-95	12,000	4,880	350	6,920	5,870	2,540	37,400	69,960
	M-ICS-6C	17-May-95	7,680	5,760	300	5,710	5,270	3,400	29,500	57,620
CORE 7	M-ICS-7DP	17-May-95	8,680	9,320	3,220	12,600	11,600	29,800	100,000	175,220
	M-ICS-7DP/QA	17-May-95	3,610	3,660	1,390	5,100	4,260	13,600	44,000	75,620
CORE 8	M-ICS-8DP	17-May-95	1,710	2,440	<300	3,020	2,240	930	16,600	26,940
	M-ICS-8DP/QA	17-May-95	5,850	8,980	630	11,600	8,000	4,100	63,900	103,060
	M-ICS-8A	17-May-95	16,000	25,800	550	17,400	13,900	11,200	89,800	174,650
	M-ICS-8B	17-May-95	12,700	22,100	440	15,800	12,100	9,660	80,400	153,200
	M-ICS-8C	17-May-95	840	6,210	840	4,980	3,000	6,700	25,400	47,970
CORE 9	M-ICS-9DP	17-May-95	5,970	7,860	<300	8,010	6,570	2,390	41,300	72,100
	M-ICS-9DP/QA	17-May-95	10,400	13,500	<300	14,300	14,200	2,670	77,200	132,270
	M-ICS-9A	17-May-95	47,600	70,800	700	45,600	43,600	11,300	284,000	503,600
CORE 10	M-ICS-10DP	17-May-95	9,750	1,130	<300	9,900	10,300	7,940	61,700	100,720
	M-ICS-10A	17-May-95	2,090	3,030	<300	1,290	1,340	3,980	8,110	19,840
	M-ICS-10B	17-May-95	19,600	32,000	700	18,400	21,000	57,700	137,000	286,400
	M-ICS-10C	17-May-95	15,400	22,800	<300	11,400	11,200	25,000	69,000	154,800
CORE 12	M-ICS-12DP upp	17-May-95	<300	1,670	<300	1,520	1,050	570	7,760	12,570
	M-ICS-12DP lowr	17-May-95	3,800	4,980	<300	5,470	4,040	2,270	27,500	48,060
	M-ICS-12A	17-May-95	5,700	7,780	<300	11,300	8,550	1,500	53,100	87,930
	M-ICS-12B	17-May-95	1,560	8,020	<300	9,100	5,660	3,020	51,500	78,860
	M-ICS-12C	17-May-95	1,190	12,500	<300	7,800	8,280	5,690	48,000	83,460

TABLE 4: Pesticide Data

Location	Site	Date	Open Date	Exposure	Sample	Method
CORE 1	H-IC3-IDP	17-May-91				
	H-IC3-IA	17-May-91				
CORE 2	H-IC3-IDP	17-May-91				
	H-IC3-JA	17-May-91				
	H-IC3-JB	17-May-91				
	H-IC3-JC	17-May-91				
CORE 3	H-IC3-IDP/ OA	17-May-91				
	H-IC3-JA	17-May-91				
	H-IC3-JB	17-May-91				
	H-IC3-JC	17-May-91				
CORE 4	H-IC3-IDP	17-May-91				
	H-IC3-IA	17-May-91				
	H-IC3-JB	17-May-91				
	H-IC3-JC	17-May-91				
CORE 5	H-IC3-IDP	17-May-91				
	H-IC3-IA	17-May-91				
	H-IC3-JB	17-May-91				
	H-IC3-JC	17-May-91				
CORE 6	H-IC3-IDP	17-May-91				
	H-IC3-IA	17-May-91				
	H-IC3-JB	17-May-91				
	H-IC3-JC	17-May-91				
CORE 7	H-IC3-IDP/ OA	17-May-91				
	H-IC3-IA	17-May-91				
	H-IC3-IDP/ OA	17-May-91				
	H-IC3-JC	17-May-91				
CORE 8	H-IC3-IDP	17-May-91				
	H-IC3-IA	17-May-91				
	H-IC3-IDP/ OA	17-May-91				
	H-IC3-JC	17-May-91				
CORE 9	H-IC3-IDP/ OA	17-May-91				
	H-IC3-IA	17-May-91				
	H-IC3-IDP/ OA	17-May-91				
	H-IC3-JC	17-May-91				
CORE 10	H-IC3-IDP	17-May-91				
	H-IC3-IA	17-May-91				
	H-IC3-IDP	17-May-91				
	H-IC3-IDP/ OA	17-May-91				
	H-IC3-JC	17-May-91				
CORE 11	H-IC3-IDP	17-May-91				
	H-IC3-IA	17-May-91				
	H-IC3-IDP	17-May-91				
	H-IC3-IDP/ OA	17-May-91				
	H-IC3-JC	17-May-91				

TABLE 6: Tetra/Octa Chlorinated Dioxins and Furans

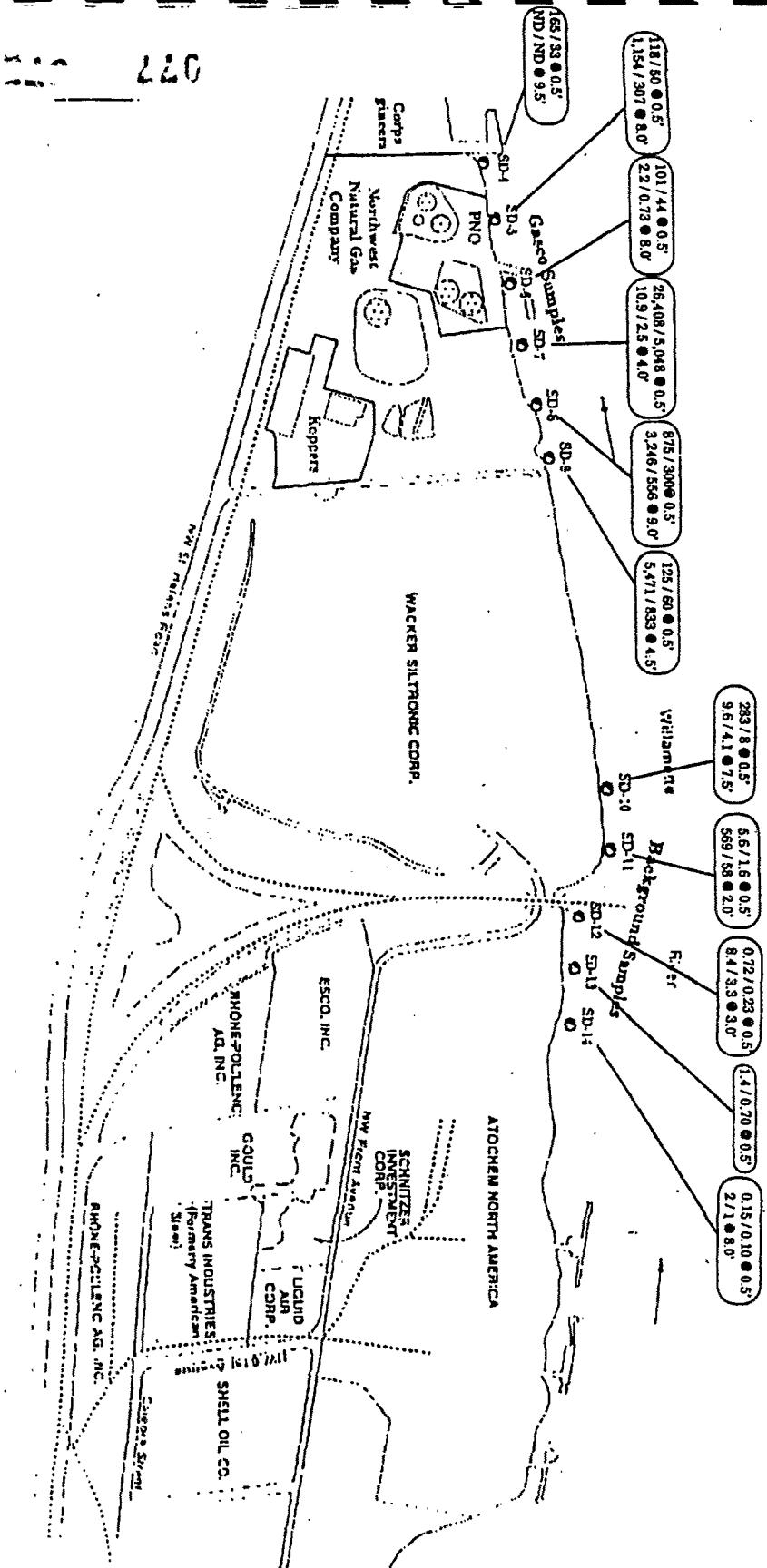
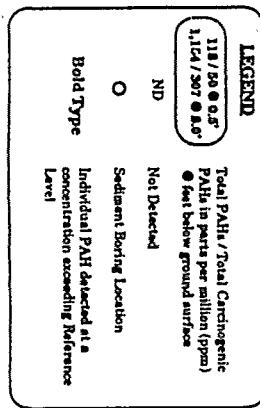
Location	Site	Date	2378 TOTAL		12378 TOTAL		123478		123878		123789 TOTAL		1234878 TOTAL	
			TCDD	TCDF	PECDD	PECDF	HXCDD	HXCDF	HXCDD	HXCDF	HXCDD	HPCDD	HPCDF	OCDD
CORE2	M-ICS-2B	17-May-95	-1.20	0.8	-1.0	0.0	2.1	15	5.8	110	270	590	3,400	
CORE3	M-ICS-3B	17-May-95	0.98	3.2	1.1	0.0	3.8	13	6.3	94	220	450	3,100	
CORE8	M-ICS-6B	17-May-95	1.20	6.7	1.9	13.0	4.7	21	8.7	160	420	970	6,800	
CORE8	M-ICS-6DP	17-May-95	-0.80	6.8	1.7	8.0	2.4	17	2.0	120	380	850	5,700	
	M-ICS-6DP/DA	17-May-95	-0.77	14.0	-1.3	7.8	3.8	14	4.8	110	280	650	4,300	
	M-ICS-6B	17-May-95	-0.98	8.8	0.8	0.7	0.9	0.0	1.6	82	270	550	2,300	
CORE12	M-ICS-12B	17-May-95	-0.64	2.3	1.1	10.0	1.8	13	3.8	120	270	690	4,100	

Location	Site	Date	2378 TOTAL		12378 TOTAL		23478 TOTAL		123478		123878		23478 TOTAL		123789 TOTAL		1234878 TOTAL	
			TCDF	TCDF	PECDF	PECDF	PECDF	PECDF	HXCDF	HXCDF	HXCDF	HXCDF	HXCDF	HXCDF	HPCDF	HPCDF	OCDF	
CORE2	M-ICS-2B	17-May-95	27	86	34	23	130	78	22	10	11	220	120	21	340	300		
CORE3	M-ICS-3B	17-May-95	62	170	59	38	170	93	29	9.1	10	220	86	22	220	210		
CORE8	M-ICS-6B	17-May-95	32	130	63	38	220	120	36	16	17	380	160	30	630	630		
CORE8	M-ICS-6DP	17-May-95	67	190	180	62	340	270	65	10	48	640	180	40	430	370		
	M-ICS-6DP/DA	17-May-95	49	170	90	52	270	140	38	15	16	330	130	23	370	360		
	M-ICS-6B	17-May-95	17	82	24	19	100	54	14	3.2	10	280	74	11	170	150		
CORE12	M-ICS-12B	17-May-95	2.0	100	2.6	0.3	110	13	13	5.3	2.5	340	370	3.4	870	130		

TABLE 3: TBT Data.

Location	Site	Date	MBT	DBT	TBT
CORE 2	M-ICS-2B	17-May-95	-3	-3	-3
CORE 3	M-ICS-3B	17-May-95	-3	-3	-3
CORE 6	M-ICS-6B	17-May-95	-3	-3	-3
CORE 8	M-ICS-8DP	17-May-95	-3	-3	-3
	M-ICS-8DP/QA	17-May-95	-3	-3	-3
	M-ICS-8B	17-May-95	-3	-3	-3
CORE 12	M-ICS-12B	17-May-95	-3	-3	-3

APPENDIX A-4
SEDIMENT CHEMISTRY DATA
SITE 8 - GASCO



0
400
1,200
Approximate Scale in Feet

Note: Base Map from Geogarthy & Miller, Inc. Hydrogeological Investigation of the Doane Lake Area.

Q
7
8

TABLE 7a - Summary Of Analytical Results for Sediment Samples: On-Site Ponds, Ditch, and Willamette River
TPH, BTEX, Total PAHs, Total Phenols, Total Organic Carbon, and Lead

Remedial Investigation
Northwest Natural Gas Company - Gasco Facility
Portland, Oregon

Soil Boring Number	Sample Number*	Chain of Custody Number	Sample Date	Depth (feet bgs)	Analytical Results mg/kg (ppm)												EPA Meth- 415.1 Total Organic Carbon	
					ODEQ Method TPH-HCID			ODEQ Method		EPA Method 8270 SIM		EPA Method 8020						
					TPH-G		TPH-418.1M	Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Carcinogenic PAHs	Total PAHs	Benzene	Toluene	Ethyl benzene	Xylenes
					-	-	-	-	-	-	-	-	-	-	-	-	-	
SD-1	960130-SD1-01	2708-SD010	30-Jan-96	0.5	ND>20	Detected	Detected	-	140	1,063	1,935	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	90,700	
SD-2	960130-SD2-01	2708-SD010	30-Jan-96	0.5	-	-	-	16	1,200	3,722	21,665	ND>0.3	ND>0.3	ND>0.3	0.34	0.34	134,000	
SD-3	960130-SD3-01	2708-SD010	30-Jan-96	0.5	-	-	-	ND>10	1,100	2,628	10,670	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	75,500	
SD-4	960123-SD4-01	2708-SD003	23-Jan-96	0.5	ND>20	Detected	Detected	-	91	33	165	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	17,000	
SD-4	960123-SD4-11	2708-SD003	23-Jan-96	9.5	ND>20	ND>50	ND>100	-	-	0.10	0.15	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	-	
SD-5	960123-SD5-01	2708-SD003	23-Jan-96	0.5	ND>20	ND>50	ND>100	-	-	50	118	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	18,500	
SD-5	960123-SD5-09	2708-SD004	23-Jan-96	8.0	-	-	-	ND>10	160	307	1,154	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	-	
SD-6	960123-SD6-01	2708-SD004	23-Jan-96	0.5	ND>20	Detected	Detected	-	240	44.2	101	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	5,400	
SD-6	960123-SD6-09	2708-SD005	23-Jan-96	8.0	ND>20	ND>50	ND>100	-	-	0.73	2.2	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	-	
SD-7	960123-SD7-01	2708-SD006	23-Jan-96	0.5	Detected	Detected	Detected	300	5,100	5,048	26,408	22	4.2	10	18	54.2	120,000	
SD-7	960123-SD7-05	2708-SD006	23-Jan-96	8.5	ND>20	ND>50	ND>100	-	-	2.5	10.9	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	-	
SD-8	960123-SD8-01	2708-SD006	23-Jan-96	0.5	ND>20	ND>50	ND>100	-	-	300	875	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	41,000	
SD-8	960123-SD8-10	2708-SD007	23-Jan-96	9.0	-	-	-	44	910	556	3,254	ND>0.3	ND>0.3	1.3	1.3	2.6	-	
SD-9	960124-SD9-01	2708-SD007	24-Jan-96	0.5	ND>20	ND>50	ND>100	-	-	60	125	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	34,000	
SD-9	960124-SD9-02 (Dmin)	2708-SD007	24-Jan-96	0.5	-	-	-	-	-	44	94	-	-	-	-	-	28,000	
SD-9	960124-SD9-06	2708-SD008	24-Jan-96	4.5	-	-	-	110	380	833	5,471	1.8	ND>0.3	6.2	6.0	14.0	-	
SD-10	960123-SD10-01	2708-SD008	23-Jan-96	0.5	ND>20	ND>50	ND>100	-	-	8.0	283	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	9,600	
SD-10	960123-SD10-09	2708-SD008	23-Jan-96	7.5	ND>20	Detected	ND>100	-	290	4.1	9.6	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	-	
SD-11	960123-SD11-01	2708-SD008	23-Jan-96	0.5	-	-	-	ND>10	9.6	1.6	5.6	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	830	
SD-11	960123-SD11-03	2708-SD009	23-Jan-96	2.0	ND>20	-	-	-	280	58	569	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	-	
SD-12	960124-SD12-01	2708-SD002	24-Jan-96	0.5	ND>20	ND>50	ND>100	-	-	0.23	0.72	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	5,000	
SD-12	960124-SD12-04	2708-SD002	24-Jan-96	3.0	ND>20	ND>50	ND>100	-	-	3.3	8.4	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	-	
SD-13	960124-SD13-01	2708-SD001	24-Jan-96	0.5	ND>20	ND>50	ND>100	-	-	0.70	1.4	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	4,800	
SD-14	960124-SD14-01	2708-SD005	24-Jan-96	0.5	ND>20	Detected	ND>100	-	96	0.10	0.15	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	8,000	
SD-14	960124-SD14-09	2708-SD005	24-Jan-96	8.0	-	-	-	-	-	1	2	ND>0.3	ND>0.3	ND>0.3	ND>0.3	ND	-	
Reference Standards**						-	-	-	80	500	-	-	2.0	80	100	800*	40,000	

Note: BTEX = benzene, toluene, ethylbenzene, and xylenes
EPA = U.S. Environmental Protection Agency
HCID = hydrocarbon identification
TPH = total petroleum hydrocarbons
PAHs = polynuclear aromatic hydrocarbons

mg/kg = milligrams/kilogram
ppm = parts per million
ND = not detected above detection limit indicated
ODEQ = Oregon Department of Environmental Quality

* = Sample number prefix: 2708
= Detected hydrocarbons in the diesel range appear to be due to a high concentration of oil hydrocarbons
** = TPH standards based on the ODEQ UST Level 2 Soil Cleanup Standards (OAR 340-122-335);
Other standards based on Soil Cleanup Levels in the Soil Cleanup Table (OAR 340-122-045)
BOLD = Detected above Reference Standard

TABLE 7b - Summary Of Analytical Results for Sediment Samples: On-Site Ponds, Ditch, and Willamette River
PAHs by EPA Method 8270 (SIM)

Remedial Investigation
Northwest Natural Gas Company Gasco Facility
Portland, Oregon

SD-4 thru SD-14 . W 1 in res.

Soil Boring	Sample Number*	Chain of Custody No.	Sample Date	Sample Depth (feet bgs)	Analytical Results mg/kg (ppm)															
					Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	
SD-1	960130-SD1-01	2708-SD010	30-Jan-96	0.5	5.7	41.3	24	141	246	76	205	226	215	28.9	255	ND>5	151	8.1	14.7	297
SD-2	960130-SD2-01	2708-SD010	30-Jan-96	0.5	1,408	194	1,030	688	695	262	729	594	899	68.6	3,006	1,038	380	1,437	6,001	3,235
SD-3	960130-SD3-01	2708-SD010	30-Jan-96	0.5	397	104	419	458	498	182	472	422	693	48.1	2,013	304	269	12.8	2,230	2,140
SD-4	960123-SD4-01	2708-SD003	23-Jan-96	0.5	5.9	0.59	4.9	5.6	6.8	2.7	5.6	6.1	7.8	0.65	19.9	4.8	3.8	32.2	34.6	23.0
SD-4	960123-SD4-11	2708-SD003	23-Jan-96	9.5	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50
SD-5	960123-SD5-01	2708-SD003	23-Jan-96	0.5	4.3	ND>50	4.0	8.4	9.3	3.0	11	9.9	11	1.3	13	2.0	5.8	1.6	15	18
SD-5	960123-SD5-09	2708-SD004	23-Jan-96	8.0	45.8	2.3	63.4	52.7	56.8	20.6	64.5	47.1	72.5	6.6	174	28.9	32.9	6.5	266	213
SD-6	960123-SD6-01	2708-SD004	23-Jan-96	0.5	1.3	0.65	2.0	6.6	9.4	3.7	9.7	8.0	8.8	0.86	18.2	0.75	5.1	0.37	3.5	22.5
SD-6	960123-SD6-09	2708-SD005	23-Jan-96	8.0	0.05	ND>50	0.07	0.10	0.14	0.06	0.17	0.21	0.15	ND>50	0.34	ND>50	0.12	0.06	0.26	0.47
SD-7	960123-SD7-01	2708-SD006	23-Jan-96	0.5	1,600	140	1,100	840	930	350	1,000	820	1,300	98	3,000	800	530	5,100	5,400	3,400
SD-7	960123-SD7-05	2708-SD006	23-Jan-96	8.5	0.25	0.24	0.51	0.37	0.45	0.18	0.52	0.49	0.64	ND>75	1.4	0.24	0.3	1.4	2.1	18
SD-8	960123-SD8-01	2708-SD006	23-Jan-96	0.5	21	67	28	49	59	21	69	57	58	6.9	160	12	37	3.9	96	190
SD-8	960123-SD8-10	2708-SD007	23-Jan-96	9.0	170	13	190	120	100	36	110	75	140	10	340	120	48	580	770	440
SD-9	960124-SD9-01	2708-SD007	24-Jan-96	0.5	1.6	1.5	2.6	8.7	12	4.5	14	12	11	1.4	18	0.83	7.9	0.81	8.1	20
SD-9	960124-SD9-02 (Dup)	2708-SD007	24-Jan-96	0.5	1.1	0.88	1.5	6.5	8.6	3.3	10	9.6	8.8	1.1	14	0.45	5.9	0.73	5.1	16
SD-9	960124-SD9-06	2708-SD008	24-Jan-96	4.5	460	28	230	150	160	57	180	140	180	16	540	190	90	1,500	1,000	550
SD-10	960123-SD10-01	2708-SD008	23-Jan-96	0.5	16	190	5.5	2.1	1.3	0.5	1.1	0.69	2.4	0.10	12	11	0.46	0.10	31	91
SD-10	960123-SD10-09	2708-SD008	23-Jan-96	7.5	0.10	0.09	0.18	0.64	0.82	0.29	0.84	0.67	1.0	0.09	1.5	ND>68	0.45	ND>68	1.0	19
SD-11	960123-SD11-01	2708-SD008	23-Jan-96	0.5	0.34	ND>66	0.21	0.25	0.32	0.12	0.32	0.33	0.38	ND>66	0.87	0.39	0.21	ND>66	1.1	0.78
SD-11	960123-SD11-03	2708-SD009	23-Jan-96	2.0	40	0.38	58	17	8.1	3.7	5.3	1.6	16	ND>74	100	66	1.3	ND>74	260	74
SD-12	960124-SD12-01	2708-SD009	24-Jan-96	0.5	ND>50	ND>50	ND>50	ND>50	0.067	ND>50	0.06	0.11	0.05	ND>50	0.13	ND>50	0.06	ND>50	0.06	0.19
SD-12	960124-SD12-04	2708-SD009	24-Jan-96	3.0	0.055	0.05	0.13	0.38	0.66	0.22	0.83	1.2	0.53	0.06	1.1	ND>50	0.59	0.06	0.39	21
SD-13	960124-SD13-01	2708-SD009	24-Jan-96	0.5	ND>50	ND>50	0.044	0.097	0.15	0.07	0.13	0.14	0.17	ND>50	0.2	ND>50	0.09	ND>50	0.08	0.21
SD-14	960124-SD14-01	2708-SD009	24-Jan-96	0.5	ND>50	ND>50	ND>50	ND>50	0.05	ND>50	0.05	0.05	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	ND>50	
SD-14	960124-SD14-09	2708-SD009	24-Jan-96	8.0	ND>50	ND>50	0.07	0.16	0.12	0.054	0.13	0.06	0.18	ND>50	0.22	ND>50	0.05	ND>50	0.12	0.21
Industrial Maximum Allowable Soil Concentration** ->					100,000	#	600,000	1	1	1	1	#	1	1	80,000	80,000	1	8,000	#	60,000
Soil Cleanup Level** ->					2,000	#	20,000	0.1	0.1	0.1	0.1	#	0.1	0.1	8,000	2,000	0.1	30	#	6,000

Note:
 * = Sample number prefix: 2708
 # = Cleanup level not established
 bgs = below ground surface

DEQ = Oregon Department of Environmental Quality
 EPA = U.S. Environmental Protection Agency
 mg/kg = milligrams/kilogram

ND = Not detected above detection limit indicated
 PAHs = polynuclear aromatic hydrocarbons
 ppm = parts per million

** = Reference Standards based on Soil Cleanup Levels in the Soil Cleanup Table (OAR 340-122-045).

APPENDIX A-5

SEDIMENT CHEMISTRY DATA

SITE 9 - McCORMICK AND BAXTER CREOSOTING COMPANY

SITE ID: 74 McCormick & Baxter Creosoting Co.

SITE SUMMARY REPORT

initiated a Remedial Investigation (RI) and Feasibility Study (FS) in 1990. Limited funding was received from M&B before the company declared bankruptcy. The investigation continued using state monies (i.e. the site was declared an Orphan). The RI/FS was completed in September 1992. The Record of Decision (ROD) was delayed due to the pending listing of the site on the federal National Priorities List (aka "Superfund" list).

PATHWAYS:

Soil and groundwater at the site, and sediments in the adjacent Willamette River, are heavily contaminated. The primary pathway of concern is direct contact with contaminated surface soils and sediments along the shoreline. Access to the site is restricted by chain link fencing and security guards. Soils were seeded with grass in 1992 to prevent dust transport to off-site areas. Groundwater is not used at or in the vicinity of the site. Although fish tissue sampling results do not indicate a problem with bioaccumulation of contaminants from the site, warning signs have been installed around contaminated sediment areas.

SUBSTANCE CONTAMINATION

<u>SUBSTANCE</u>	<u>MEDIA CONTAMINATED</u>	<u>CONCENTRATION LEVEL</u>	<u>EVIDENCE</u>	<u>OBSERV. DATE</u>
ARSENIC	Groundwater Sediment Soil Surface Water Storage Area Retort 3 Area Date released: unknown Quantity Released: unknown Data Source: Remedial Investigation DEQ Contractor Reports	1,700 ppb 18 ppm 25,000 ppm 7,600 ppb	Laboratory Data Laboratory Data Laboratory Data Laboratory Data	
CHROMIUM	Groundwater Soil Surface Water Drum Landfill Storage-Tank (above-ground) Surface Impoundment Closed Date released: 1945-1971 Quantity Released: unknown Data Source: Remedial Action Cerclis file, RI Report DEQ Contractor Reports	900 ppb 17,000 ppm 800 ppb	Laboratory Data Laboratory Data Laboratory Data	
COPPER	Groundwater Sediment	5,400 ppb 330 ppm	Laboratory Data Laboratory Data	

SITE ID: 74

McCormick & Baxter Creosoting Co.

SITE SUMMARY REPORT

	Soil	7,900 ppm	Laboratory Data
	Surface Water	15,000 ppb	Laboratory Data
	Drum		
	Landfill		
	Storage-Tank (above-ground)		
	Surface Impoundment		
	Closed		
	Date released: 1945-1971		
	Quantity Released: unknown		
	Data Source: Remedial Action Cerclis file, RI Report		
	DEQ Contractor Reports		
PENTACHLOROPHENOL	Groundwater	8,300 ppm product	Laboratory Data
	>Sediment	1.8 mg/kg river sed	Laboratory Data
	Soil	190,000 mg/kg	Laboratory Data
	Surface Water	1.8 ppm river	Laboratory Data
	Drum		
	Landfill		
	Storage-Tank (above-ground)		
	Surface Impoundment		
	Closed		
	Date released: unknown		
	Quantity Released: unknown		
	Data Source: Remedial Action Cerclis file, RI Report		
	DEQ Contractor Reports		
	Site Responce project files		
POLYAROMATIC HYDROCARBONS (PAH)	Groundwater	free product creosote	Laboratory Data
	>Sediment	5,000 ppm	Laboratory Data
	Soil	27,500 ppm	Laboratory Data
	Surface Water	350 ppb	Laboratory Data
	Comments: samples reflect creosote contamination		
	Drum		
	Landfill		
	Storage-Tank (above-ground)		
	Surface Impoundment		
	Closed		
	Date released: 1945-1971		
	Quantity Released: unknown		
	Data Source: Remedial Action Cerclis file, RI Report		
	DEQ Contractor Reports		

ENVIRONMENTAL/HEALTH THREATS:

Contaminated river sediments are adjacent to the site. Creosote and PCP continue to leak into the river and groundwater. St. Johns Park is one mile

McCormick & Parker

Table 5-6

CONTAMINANT CONCENTRATIONS IN SEDIMENTS (1990)

Compound	Range (mg/kg DW)		Range (mg/kg OC)		Location of Maximum Concentration ^a
	Minimum	Maximum	Minimum	Maximum	
Naphthalene	0.010 U	3,500 E	0.68 U	88,000 E	Creosote Dock
Acenaphthalene	0.012 U	17	0.68 U	2,000 E	Bank north of BNRR trestle
Acenaphthene	0.019 U	1,300	1.3 U	73,000 E	Bank north of BNRR trestle
Fluorene	0.010 U	1,100 E	0.68 U	80,000 E	Bank north of BNRR trestle
Phenanthrene	0.013 U	1,900 E	0.84	150,000 E	Bank north of BNRR trestle
Anthracene	0.012 U	290	0.68 U	22,000 E	Bank north of BNRR trestle
Fluoranthene	0.010 U	960	2.1	60,000 E	Bank north of BNRR trestle
Pyrene	0.010 U	610	2.4	40,000 E	Bank north of BNRR trestle
Benz[a]anthracene	0.012 U	170	0.88 U	12,000 E	Bank north of BNRR trestle
Chrysene	0.012 U	170	0.88 U	7,700 E	Bank north of BNRR trestle
Benz[b,k]fluoranthene	0.012 U	170	0.88 U	14,000 L	Bank north of BNRR trestle
Benz[a]pyrene	0.012 U	58	0.75 U	2,900 E	Bank north of BNRR trestle
Benz[e]pyrene	0.012 U	50	0.68 U	1,900 UE	Bank north of BNRR trestle
Indeno[1,2,3-cd]pyrene	0.062 U	87	3.3 UE	2,200	Creosote Dock
Dibenz[a,h]anthracene	0.062 U	87	1.7	2,200	Creosote Dock
Pentachlorophenol	0.0024 U	7.2 E	NA	NA	SW Corner of M & B property
Dioxins/Furans (TEC)	2.1×10^{-4} L	2.7×10^{-3} E	9.0×10^{-4} L	4.8×10^{-2} E	Creosote dock
Arsenic	1.8	18 E	NA	NA	Creosote dock
Chromium	1.1	64 E	NA	NA	Between Outfalls 003 & 004
Chromium ⁶⁺	0.07 UG	0.99 G	NA	NA	Outfall 003
Copper	12	330	NA	NA	Upstream
Zinc	35 EM	490 EM	NA		Bank north of BNRR trestle

^a Based on organic carbon-normalized data for PAHs and PCDDs/PCDFs.

Abbreviations:

- BNRR - Burlington Northern Railroad
 DW - dry weight
 EAR - elevated above reference
 NA - data for these contaminants are not organic carbon-normalized
 OC - organic carbon-normalized
 TEC - Toxicity equivalent concentration

Qualifiers:

- E - estimated
 G - actual value is probably greater than reported value
 L - actual value is probably less than reported value
 M - mean
 U - undetected at detection limit shown

APPENDIX A-6
SEDIMENT CHEMISTRY DATA
SITE 10 - RHONE-POULENC, INC.

TABLE I-1
Summary of Chemical Analysis of Surface Water and Sediment
Halogenated¹ and Aromatic² Volatile Organic Compounds

January 31 - February 1, 1995 Samples³

Analyte	5-PR-tracks		Front Esplanade-N		N-PR-tracks		WR-1 upgrd.		WR-2 offshore		WR-3		WR-3 Dup ⁴		Wacker outfall	
	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water
2-Chloroethyl vinyl ether	500 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND
Chloromethane	500 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND
Bromomethane	500 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND
Vinyl chloride	200 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND
Chloroethane	500 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND
Methylene chloride	500 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND
Trichlorofluoromethane (Freon 11)	500 ND	10 ND	20 ND	10 ND	20 ND	5 ND	20 ND	10 ND	20 ND	10 ND	20 ND	10 ND	20 ND	10 ND	20 ND	10 ND
1,1-Dichloroethene	100 ND	0.5 ND	1 ND	0.5 ND	1 ND	10 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND
1,1-Dichloroethane	100 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND
1,2-Dichloroethene	100 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND
Chloroform	100 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	500 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND
1,2-Dichloroethane	100 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND
1,1,1-Trichloroethane	100 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND
Carbon tetrachloride	100 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND
Bromodichloromethane	100 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND
Dichlorodifluoromethane (Freon 12)	100 ND	10 ND	20 ND	10 ND	20 ND	10 ND	20 ND	10 ND	20 ND	10 ND	20 ND	10 ND	20 ND	10 ND	20 ND	10 ND
1,2-Dichloropropane	100 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND
trans-1,3-Dichloropropene	100 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND
Trichloroethene	100 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND
Dibromo-chloromethane	100 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND
cis-1,3-Dichloropropene	200 ND	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND
1,1,2-Trichloroethane	100 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND
1,2-Dibromoethane	200 ND	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND
Bromoform	500 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND	10 ND	5 ND
1,1,2,2-Tetrachloroethane	100 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND
Tetrachloroethene	100 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND
Chlorobenzene ¹	1100	2 ND	4 ND	2 ND	16	2 ND	4 ND	2 ND	4 ND	2 ND	4 ND	2 ND	71	2 ND	4 ND	2 ND
Chlorobenzene ²	1800	3.1	1 ND	0.76	6.2	0.8	1 ND	0.5 ND	1 ND	0.5 ND	4.6	0.6	4.1	0.6	1 ND	0.5 ND
Benzene	110	0.7	1.6	0.5 ND	1.5	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1.4	0.5 ND	1 ND	0.5 ND	1.3	0.5 ND
Toluene	50 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.77	1 ND	0.75	1 ND	0.5 ND
Ethylbenzene	50 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND	1 ND	0.5 ND
Xylenes (total)	100 ND	1.1	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND
1,3-Dichlorobenzene	100 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND	2 ND	1 ND
1,4-Dichlorobenzene	100	3	2 ND	1.7	14	1.8	2 ND	1 ND	2 ND	1 ND	4.8	1 ND	2 ND	1 ND	2 ND	1 ND
1,2-Dichlorobenzene	100 ND	6.3	2 ND	3.4	7.1	3.6	2 ND	1 ND	2 ND	1 ND	4.8	1 ND	4 ND	1 ND	2 ND	1 ND

Notes:

¹Analyzed by method #O10

²Analyzed by method #O20

³NDL 1-3 sampled on January 31, WR 1-4 sampled on February 1.

⁴WR-3 collected at Front Avenue stormwater discharge location

⁵WR-3D is a blind duplicate (labeled WR-3) of sample WR-3

ND= The analysis was not detected above the sample reporting limit. Value shown is reporting limit.

WR-3 samples re-wt'd for file.

TABLE 1-2
Summary of Chemical Analysis of Surface Water and Sediment
Semivolatile Organic Compounds¹
January 31 - February 1, 1995 Samples²
(Concentrations: sediment - ug/kg, water - ug/L)

Analyte	NDL-1		NDL-2		NDL-3		WR-1		WR-2		WR-3 ³		WR-3Dup ⁴		WR-4	
	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water								
Acenaphthene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Benzidine	1,600 ND	50 ND	1,600 ND	50 ND	1,600 ND	50 ND	1,600 ND	50 ND								
Acenaphthylene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
1-Chloronaphthalene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Dibenz(a,j)acridine	ND ⁵	ND ⁵	ND ⁵	ND ⁵	ND ⁵	ND ⁵										
1,2-Diphenylhydrazine	1,600 ND	50 ND	1,600 ND	50 ND	1,600 ND	50 ND	1,600 ND	50 ND								
Acetophenone	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
4-Aminobiphenyl	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Aniline	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Anthracene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Benzof(a)anthracene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Benzo(b)fluoranthene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Benzo(k)fluoranthene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Benzo(g,h,i)perylene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Benzo(a,p)pyrene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Benzyl alcohol	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Benzoic acid	330 ND	50 ND	330 ND	50 ND	330 ND	50 ND	330 ND	50 ND								
4-Bromophenyl phenyl ether	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Butyl benzyl phthalate	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
4-Chloraniline	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
bis(2-Chloroethyl)methane	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
bis(2-Chloroethyl) ether	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
2,2'-Oxybis(1-chloropropane)	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
2-Chloronaphthalene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
4-Chlorophenyl phenyl ether	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Chrysene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Dibenzo(a,h)anthracene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Dibenzofuran	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Di-n-butyl phthalate	660 ND	10 ND	660 ND	10 ND	660 ND	10 ND	660 ND	10 ND								
3,3'-Dichlorobenzidine	330 ND	20 ND	330 ND	20 ND	330 ND	20 ND	330 ND	20 ND								
Diethyl phthalate	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
p-Dimethylaminoazobenzene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
7,12-Dimethylbenz(a)anthracene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
α,α' -Dimethylphenylethylamine	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Dimethyl phthalate	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
4,6-Dinuro-2-methylphenol	1,600 ND	50 ND	1,600 ND	50 ND	1,600 ND	50 ND	1,600 ND	50 ND								
2,4-Dinitro-2-methylphenol	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
2,6-Dinitrotoluene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Di-n-octyl phthalate	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Diphenylamine	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
bis(2-Ethylhexyl)phthalate	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Ethyl methanesulfonate	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Fluoranthene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Fluorene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								
Hexachlorobutadiene	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND	330 ND	10 ND								

TABLE I-3
Summary of Chemical Analysis of Surface Water and Sediment
Phenols¹
January 31 - February 1, 1995 Samples²
(Concentrations: sediment - ug/kg, water - ug/L)

Analyte	NDL-1		NDL-2		NDL-3		WR-1		WR-2		WR-3 ³		WR-3Dup ⁴		WR-4	
	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water								
2,4,6-Trichlorophenol	200 ND	1 ND	44 ND	1 ND	180 ND	1 ND	45 ND	1 ND	51 ND	1 ND	120 ND	1 ND	83 ND	1 ND	45 ND	1 ND
2,4-Dimethylphenol	100 ND	0.5 ND	260 ND	0.5 ND	92 ND	0.5 ND	23 ND	0.5 ND	26 ND	0.5 ND	64 ND	0.5 ND	610 ND	0.5 ND	23 ND	0.5 ND
2,6-Dichlorophenol	590 ND	3 ND	86 ND	3 ND	540 ND	3 ND	130 ND	3 ND	150 ND	3 ND	370 ND	3 ND	83 ND	3 ND	130 ND	3 ND
2-Methyl-4, 6-dinitrophenol	200 ND	1 ND	44 ND	1 ND	180 ND	1 ND	45 ND	1 ND	51 ND	1 ND	120 ND	1 ND	43 ND	1 ND	45 ND	1 ND
2-Nitrophenol	100 ND	0.5 ND	390 ND	0.5 ND	92 ND	0.5 ND	23 ND	0.5 ND	26 ND	0.5 ND	64 ND	0.5 ND	250 ND	0.5 ND	23 ND	0.5 ND
4,6-Dichloro, 2-methylphenol	890 ND	5 ND	44 ND	5 ND	810 ND	5 ND	200 ND	5 ND	230 ND	5 ND	570 ND	5 ND	83 ND	5 ND	200 ND	5 ND
2,4-Dichlorophenol	100 ND	0.5 ND	44 ND	0.5 ND	92 ND	0.5 ND	23 ND	0.5 ND	26 ND	0.5 ND	64 ND	0.5 ND	43 ND	0.5 ND	23 ND	0.5 ND
2,4-Dinitrophenol	100 ND	1 ND	44 ND	1 ND	92 ND	1 ND	23 ND	1 ND	26 ND	1 ND	64 ND	1 ND	380 ND	1 ND	23 ND	1 ND
2-Chlorophenol	100 ND	0.5 ND	86 ND	0.5 ND	92 ND	0.5 ND	23 ND	0.5 ND	26 ND	0.5 ND	64 ND	0.5 ND	43 ND	0.5 ND	23 ND	0.5 ND
4-Chloro-3-methylphenol	100 ND	0.5 ND	44 ND	0.5 ND	92 ND	0.5 ND	23 ND	0.5 ND	26 ND	0.5 ND	64 ND	0.5 ND	43 ND	0.5 ND	23 ND	0.5 ND
4-Chloro-o-creosol	360 ND	2 ND	160 ND	2 ND	320 ND	2 ND	81 ND	2 ND	92 ND	2 ND	230 ND	2 ND	43 ND	2 ND	81 ND	2 ND
4-Chlorophenol	1,400 ND	8 ND	630 ND	8 ND	1,300 ND	8 ND	330 ND	8 ND	370 ND	8 ND	910 ND	8 ND	43 ND	8 ND	350 ND	8 ND
4-Nitrophenol	200 ND	1 ND	86 ND	1 ND	180 ND	1 ND	45 ND	1 ND	51 ND	1 ND	120 ND	1 ND	150 ND	1 ND	45 ND	1 ND
Cresols	180 ND	1 ND	78 ND	1 ND	160 ND	1 ND	41 ND	1 ND	46 ND	1 ND	110 ND	1 ND	76 ND	1 ND	41 ND	1 ND
Pentachlorophenol	200 ND	1 ND	86 ND	1 ND	180 ND	1 ND	45 ND	1 ND	51 ND	1 ND	120 ND	1 ND	83 ND	1 ND	45 ND	1 ND
Phenol	100 ND	0.5 ND	44 ND	0.5 ND	92 ND	0.5 ND	23 ND	0.5 ND	26 ND	0.5 ND	64 ND	0.5 ND	43 ND	0.5 ND	23 ND	0.5 ND

Notes:

¹ Analyzed by EPA Method 8040

² NDL 1-3 sampled on January 31, WR 1-4 sampled on February 1.

³ WR-3 collected at Front Avenue stormwater discharge location.

⁴ WR-3Dup is a blind Duplicate (labeled WR-3) of sample WR-3.

ND The analyte was not detected above the sample reporting limit. Value shown is reporting limit.

TABLE 1-4
Summary of Chemical Analysis of Surface Water and Sediment
Organochlorine Pesticides¹
January 31 - February 1, 1995 Samples²
(Concentrations: sediment - ug/kg, water - ug/L)

Analyte	NDL-1		NDL-2		NDL-3		WR-1		WR-2		WR-3 ³		WR-3Dup ⁴		WR-4	
	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water								
Perthane	100 ND	1 ND	100 ND	1 ND	100 ND	1 ND	100 ND	1 ND								
Endrin aldehyde	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND	5 ND								
alpha-BHC	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND								
beta-BHC	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND								
delta-BHC	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND								
gamma-BHC (Lindane)	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND								
Hepachlor	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND								
Aldrin	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND								
Hepachlor epoxide	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND								
Endosulfan I	8 ND	0.03 ND	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND	8 ND	0.05 ND						
Dieldrin	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND								
4,4'-DDE	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND								
Endrin	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND								
Endosulfan II	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND								
4,4'-DDD	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND								
Endosulfan sulfate	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND								
4,4'-DDT	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND								
Endrin ketone	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND	16 ND	0.1 ND								
Methoxychlor	80 ND	0.5 ND	80 ND	0.3 ND	80 ND	0.5 ND	80 ND	0.5 ND	80 ND	0.5 ND	80 ND	0.5 ND	80 ND	0.5 ND	80 ND	0.5 ND
Chlordane	80 ND	0.5 ND	80 ND	0.3 ND	80 ND	0.5 ND	80 ND	0.5 ND	80 ND	0.5 ND	80 ND	0.5 ND	80 ND	0.65	80 ND	0.71
Toxaphene	160 ND	1 ND	160 ND	1 ND	160 ND	1 ND	160 ND	1 ND								

Note:

¹ Analyzed by EPA Method 8080

² NDL-1 sampled on January 31, WR-1-4 sampled on February 1

³ WR-3 collected at Front Avenue stormwater discharge location.

⁴ WR-3Dup is a blind duplicate (labeled WR-5) of sample WR-3.

J: The analyte was positively identified, the associated numerical value is the approximate concentration of the analyte in the sample.

ND: The analyte was not detected above the sample reporting limit. Value shown is reporting limit.

TABLE 1-5
Summary of Chemical Analysis of Surface Water and Sediment
Organophosphorus Pesticides¹
January 31 - February 1, 1995 Samples²
(Concentrations: sediment - ug/kg, water - ug/L)

Analyte	NDL-1		NDL-2		NDL-3		WR-1		WR-2		WR-3 ³		WR-3Dup ⁴		WR-4	
	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water								
Malathion	50 ND	1 ND	50 ND	98	50 ND	1 ND	50 ND	1 ND								
TEPP	50 ND	2.5 ND	50 ND	2.5 ND	50 ND	2.5 ND	50 ND	2.5 ND								
Azophos-methyl	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Bolstar	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Chlorpyrifos	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Coumaphos	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Dimecon OAS	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Diazinon	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Dechlorvos	50 ND	2 ND	50 ND	2 ND	50 ND	2 ND	50 ND	2 ND								
Disulfoton	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Ethoprop	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Fenvalfocten	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Fenthion	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Morphos	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Mvinophos	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Naled	50 ND	2 ND	50 ND	2 ND	50 ND	2 ND	50 ND	2 ND								
Methyl parathion	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Phorate	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Ronnel	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Seurphos	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Tetradion (Prothiofos)	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								
Trichlorfon	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND	50 ND	1 ND								

Notes:

¹ Analyzed by EPA Method 8140

² NDL-1 sampled on January 31; WR-1-4 sampled on February 1

³ WR-3 collected at Front Avenue stormwater discharge location.

⁴ WR-3Dup is a blind duplicate (labeled WR-5) of sample WR-3

ND: The analyte was not detected above the sample reporting limit. Value shown is reporting limit.

TABLE 1-6
Summary of Chemical Analysis of Surface Water and Sediment
Chlorinated Herbicides¹
January 31 - February 1, 1995 Samples²
(Concentrations: sediment - ug/kg, water - ug/L)

Analyte	NDL-1		NDL-2		NDL-3		WR-1		WR-2		WR-3 ³		WR-3Dup ⁴		WR-4	
	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water
Bromoxynil	620 ND	5 ND	25 ND	6.2 ND	250 ND	6.2 ND	25 ND	0.25 ND	120 ND	0.25 ND	250 ND	0.25 ND	1200 ND	1.2 ND	25 ND	0.25 ND
2,4-D	620 ND	130	25 ND	140	250 ND	150	25 ND	0.25 ND	120 ND	0.25 ND	250 ND	1	1200 ND	1.2	25 ND	0.25 ND
2,4-DB	500 ND	1 ND	100 ND	1 ND	1,000 ND	1 ND	100 ND	1 ND	500 ND	1 ND	1,000 ND	1 ND	5,000 ND	1 ND	100 ND	1 ND
2,4,5-TP (Silvex)	25 ND	0.14	5 ND	0.2	50 ND	0.22	5 ND	0.05 ND	25 ND	0.05 ND	50 ND	0.083	250 ND	0.11	5 ND	0.05 ND
2,4,5-T	25 ND	9.5	5 ND	7.9	50 ND	8.3	5 ND	0.05 ND	25 ND	0.05 ND	50 ND	0.05 ND	250 ND	0.05 ND	5 ND	0.05 ND
MCPP	25,000 ND	50 ND	5,000 ND	50 ND	50,000 ND	50 ND	5,000 ND	50 ND	25,000 ND	50 ND	50,000 ND	50 ND	250,000 ND	50 ND	5,000 ND	50 ND
MCPA	25,000 ND	50 ND	5,000 ND	50 ND	50,000 ND	50 ND	5,000 ND	50 ND	25,000 ND	50 ND	50,000 ND	50 ND	250,000 ND	50 ND	5,000 ND	50 ND
Dinotrol	120 ND	0.25 ND	25 ND	0.25 ND	250 ND	0.25 ND	25 ND	0.25 ND	120 ND	0.25 ND	250 ND	0.25 ND	1200 ND	0.25 ND	25 ND	0.25 ND
Dalapon	500 ND	5 ND	100 ND	5 ND	100 ND	5 ND	100 ND	5 ND	500 ND	5 ND	1,000 ND	5 ND	5,000 ND	5 ND	100 ND	5 ND
Dichlorprop	120 ND	0.25 ND	25 ND	0.25 ND	250 ND	0.25 ND	25 ND	0.25 ND	120 ND	0.25 ND	250 ND	0.25 ND	1200 ND	0.25 ND	25 ND	0.25 ND
Dicamba	50 ND	0.1 ND	10 ND	0.1 ND	100 ND	0.1 ND	10 ND	0.1 ND	50 ND	0.1 ND	100 ND	0.1 ND	500 ND	0.1 ND	10 ND	0.1 ND

Notes:

¹ Analyzed by EPA Method 8150² NDL 1-3 sampled on January 31, WR 1-4 sampled on February 1.³ WR-3 collected at the Front Avenue stormwater discharge location.⁴ WR-3Dup is a blind duplicate (labeled WR-5) of sample WR-3.⁵: The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

ND: The analyte was not detected above the sample reporting limit. Value shown is reporting limit.

TABLE I-7
Summary of Chemical Analysis of Surface Water and Sediment
Dioxins/Furans¹
January 31-February 1, 1995 Samples²
(Concentrations: sediment - pg/g, water - pg/L)

Analyte	NDL-1		NDL-2		NDL-3		WR-1		WR-2		WR-3 ³		WR-3Dup ⁴		WR-4	
	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water								
2,3,7,8-TCDF	9.4	2.8 ND	2.7	1.7 ND	7.7	1.5 ND	1.6	0.76 ND	19	1.5 ND	8.5	6.4	6.5	6.4	4.3	6.1
Total TCDFs	150	6.1	61	4.6 ND	120	4.7 ND	6.1	1.3 ND	70	1.5 ND	91	90	97	78	20	61
1,2,3,7,8-PeCDF	23 ND	2.3 ND	1.2 ND	1.6 ND	1.5 ND	1.5 ND	0.97 ND	1.3 ND	86	1.9 ND	5	4.8 ND	4.2 ND	4.9 ND	6.2	4.1 ND
2,3,4,7,8-PeCDF	1.9 ND	2 ND	0.97 ND	1.4 ND	1.4 ND	1.3 ND	0.65 ND	1.2 ND	22	1.7 ND	38 ND	5.4 ND	3.6 ND	5.6 ND	2.3 ND	1.6 ND
Total PeCDFs	80	6.9 ND	34	4.2 ND	59	4 ND	9.2	1.3 ND	180	1.9 ND	61	25 ND	60	24 ND	6.2	4.1 ND
1,2,3,4,7,8-HxCDF	31 ND	3.2 ND	2 ND	1.7 ND	2.4 ND	1.4 ND	1.2 ND	1.2 ND	140	0.84 ND	11	16 ND	10	15 ND	6.7	4.3 ND
1,2,3,4,7,8-HxCDF	32 ND	2.4 ND	1.6 ND	1.1 ND	2.5 ND	1.1 ND	1.9 ND	1.5 ND	65	0.63 ND	96 ND	11 ND	17 ND	10 ND	2.6 ND	1.5 ND
1,2,3,4,7,8-HxCDF	12 ND	1.3 ND	0.82 ND	0.9 ND	0.89 ND	0.93 ND	0.41 ND	1.6 ND	13	0.46 ND	3.3 ND	7.3 ND	3.5 ND	7.2 ND	0.77 ND	0.71 ND
1,2,3,7,8,9-HxCDF	0.18 ND	0.65 ND	0.2 ND	0.97 ND	0.27 ND	1.4 ND	0.18 ND	2 ND	3.5 ND	0.56 ND	0.41 ND	0.96 ND	0.3 ND	0.86 ND	0.28 ND	0.1 ND
Total HxCDFs	20	23 ND	20	10 ND	20	8.9 ND	5.2	2 ND	260	0.84 ND	83	17	90	84	6.7	45 ND
1,2,3,4,6,7,8-HpCDF	15	43	13	21 ND	13	17 ND	8.3	1.2 ND	90	1.6 ND	76 ND	110	87 ND	120	6.3	35 ND
1,2,3,4,7,8,9-HpCDF	1.6 ND	3.9 ND	1.2 ND	1.9 ND	1.2 ND	1.5 ND	1.1 ND	0.59 ND	33	0.35 ND	6	12 ND	8.3	12 ND	1.6 ND	1.9 ND
Total HpCDFs	43	160	43	74	40	41	33	1.2 ND	160	1.9 ND	150	340	330	340	12	35 ND
OCDF	37	170	41	82	35	64	38	3.6 ND	120	4.8 ND	330	340	360	320	15	7.6 ND
2,3,7,8-TCDD	6	8.2	2.9	3.7 ND	4.6	3.6 ND	0.31 ND	0.9 ND	0.41 ND	1 ND	3.4	3.2 ND	2.5	4.4 ND	0.24 ND	0.84 ND
Total TCDDs	100	8.2	37	4.3 ND	80	3.6 ND	0.93 ND	2.2 ND	11	2 ND	14	31	15	14	66	2.2 ND
1,2,3,7,8-PeCDD	13 ND	1.2 ND	0.84 ND	1.6 ND	0.97 ND	1.9 ND	0.45 ND	1.3 ND	0.63 ND	1.5 ND	1.9 ND	2.7 ND	0.44 ND	1.2 ND	1.8 ND	2.7 ND
Total PeCDDs	8.5	2.3 ND	3.5 ND	1.6 ND	6.4	1.9 ND	0.85 ND	1.3 ND	1.3 ND	1.5 ND	3.6 ND	8.4 ND	2.4 ND	7.5 ND	1 ND	1.5 ND
1,2,3,4,7,8-HxCDD	12 ND	1.8 ND	1.1 ND	1.2 ND	1.1 ND	0.65 ND	0.48 ND	1.3 ND	0.58 ND	1.6 ND	4 ND	4.9 ND	5	4.6 ND	0.4 ND	1.4 ND
1,2,3,6,7,8-HxCDD	4.4 ND	5.3 ND	4.2 ND	3.1 ND	4.1 ND	2.3 ND	2 ND	1.2 ND	2.1 ND	1.6 ND	15	20 ND	19	19 ND	1.3 ND	1.3 ND
1,2,3,7,8,9-HxCDD	3.3 ND	4.2 ND	2.6 ND	2.6 ND	2.7 ND	2.5 ND	1.4 ND	1.3 ND	1.1 ND	1.4 ND	9.4	15 ND	12	14 ND	1.2 ND	1.4 ND
Total HxCDDs	26	13 ND	24	7.1 ND	19	6 ND	5.2	1.3 ND	5.2	1.6 ND	85	79	110	71	5	1.4 ND
1,2,3,4,6,7,8-HpCDD	69	140	70	64	70	51	40	5.3 ND	34	6.6 ND	380	540	540	520	26	7.4 ND
Total HpCDDs	160	400	150	180	150	140	83	5.3 ND	88	6.6 ND	740	1100	960	1000	87	8.6 ND
OCDD	650	1500	860	740	820	570	350	48 ND	330	60	3600	6200	6200	5400	250	67

Note:

¹ Analyzed by EPA Method 8290.² NDL 1-3 sampled on January 31; WR 1-4 sampled on February 1.³ WR-3 collected at the Front Avenue stormwater discharge location.⁴ WR-3Dup is a blind duplicate (labeled WR-3) of sample WR-3.

J: The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

ND: The analyte was not detected above the sample reporting limit. Value shown is reporting limit.

TABLE 1-8
Summary of Chemical Analysis of Surface Water and Sediment

Metals¹

January 31-February 1, 1995 Samples²
(Concentrations: sediment - mg/kg, water - mg/L)

Analyst	Sediment	NDL-1		Sediment	NDL-2		Sediment	NDL-3		Sediment	WR-1		Sediment	WR-2		Sediment	WR-3		Sediment	WR-3D ⁴		Sediment	WR-4					
		Surface Water	Diss.		Surface Water	Diss.		Surface Water	Diss.		Surface Water	Diss.		Surface Water	Diss.		Surface Water	Diss.		Surface Water	Diss.		Surface Water	Diss.				
Ammonia	15.4 J	0.005	ND	0.0084	10.4 J	0.005	ND	0.0064		12.3 J	0.005	ND	0.005	ND	3.3 J	0.003	ND	0.003	ND	9.7 J	0.005	ND	0.0067	11.7 J	0.005	ND	0.0092	
Cadmium	0.22	0.0005	ND	0.0005	ND	0.18	0.0005	ND	0.0005	ND	0.2	0.0005	ND	0.005	ND	0.081	0.0005	ND	0.0005	ND	1.7	0.0005	ND	0.0027	0.91	0.0005	ND	0.0027
Chromium	7.8	0.001	ND	0.0036	10.5	0.001	ND	0.0022		7.6	0.001	ND	0.0022		11.9 J	0.001	ND	0.0024		11.9 J	0.001	ND	0.0025	16 J	0.001	ND	0.013	
Lead	31.8	0.005	ND	0.012	25.8	0.005	ND	0.0081		26.2	0.005	ND	0.005	ND	7.3	0.005	ND	0.005	ND	14.9	0.005	ND	0.05	ND	74.2	0.005	ND	0.2
Mercury	0.1 ND	0.0002	ND	0.0002	ND	0.1 ND	0.0002	ND	0.0002	ND	0.1 ND	0.0002	ND	0.0002	ND	0.1 ND	0.0002	ND	0.0002	ND	0.36	0.0002	ND	0.0014	1.5	0.0002	ND	0.0037
Zinc	40.2	0.02	ND	0.022	54.3	0.024	ND	0.02	ND	34.3	0.02	ND	0.02	ND	50.1	0.02	ND	0.02	ND	60.3	0.02	ND	0.02	ND	422	0.049	ND	0.57

Note:

¹ Analyzed by EPA Method 6000/7000.

² NDL-1-3 sampled on January 31; WR-1-4 sampled on February 1.

³ WR-3 collected at the Front Avenue stormwater discharge location.

⁴ WR-3D⁴ is a blind duplicate (labeled WR-5) of sample WR-3.

J: The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

ND: The analyte was not detected above the sample reporting limit. Value shown is reporting limit.

APPENDIX A-7

SEDIMENT CHEMISTRY DATA

SITE 11 - GOULD, INC.

SITE ID: 49

Gould Inc./NL Industries Inc.

SITE SUMMARY REPORT

CHROMIUM

Groundwater	Up to 0.017 ppm	Laboratory Data
Soil	Up to 290 ppm	Laboratory Data

Land Treatment

Landfill

Closed

Pile

Sump

Date released: Between 1949 and 1981

Quantity Released: Unknown

Data Source: Remedial Action Cerclis File, Remedial Investigation/Feasibility Study

LEAD

Air	To 5.2 microg/cu.m	Laboratory Data
Groundwater	Up to 0.29 ppm	Laboratory Data

Sediment)	Up to 12,000 ppm	Laboratory Data
-----------	------------------	-----------------

Soil	Up to 20,000 ppm	Laboratory Data
------	------------------	-----------------

Surface Water	Up to 0.28 ppm	Laboratory Data
---------------	----------------	-----------------

Comments: Lead-bearing waste contains 3.1% to 14.5% lead

Date released: Between 1949 and 1981

Quantity Released: 82,000 tons waste

Data Source: Remedial Action Cerclis File, Remedial Investigation/Feasibility Study

460

SULFURIC ACID

Groundwater	pH 5.7	Laboratory Data
-------------	--------	-----------------

Soil	pH 4.7	Laboratory Data
------	--------	-----------------

Surface Water	pH 6.3	Laboratory Data
---------------	--------	-----------------

Land Treatment

Landfill

Closed

Pile

Sump

Date released: Between 1949 and 1981

Quantity Released: 6.5 million gal.

Data Source: Remedial Action Cerclis File, Remedial Investigation/Feasibility Study

ZINC

Groundwater	Up to 6.9 ppm	Laboratory Data
-------------	---------------	-----------------

Soil	Up to 10,000 ppm	Laboratory Data
------	------------------	-----------------

Surface Water	Up to 0.041 ppm	Laboratory Data
---------------	-----------------	-----------------

Land Treatment

Landfill

Closed

Pile

Sump

Date released: Between 1949 and 1981

Quantity Released: Unknown

Data Source: Remedial Action Cerclis File, Remedial Investigation/Feasibility Study

SEDIMENT - (ROUND 1, AUG-SEPT, 1986) HL Gould

SAMPLE #	LAB#	DATE	pH	Pb mg/kg	As mg/kg	Cd mg/kg	Cr mg/kg	Hex Cr mg/kg	Zn mg/kg	Fe mg/kg	SO4 mg/kg	CE Cap (\$)	TOT SLDs I	EP Pb ng/L	EP As ng/L	EP Cd ng/L	EP Cr ng/L
SD-01	98420	08/20/86	8.10	1400	--	--	--	--	--	--	--	63.9	--	--	--	--	
SD-02	98420	08/20/86	8.00	7200	--	--	--	--	--	--	--	33.8	--	--	--	--	
SD-03	98420	08/20/86	8.50	160	--	--	--	--	--	--	--	77.2	--	--	--	--	
SD-04	98374	08/19/86	9.30	1500	41.0	2.5	360	9.3	630	18000	45000	7.4	25.9	--	--	--	
SD-05	98374	08/19/86	9.10	1000	45.0	4.4	860	4.2	920	41000	5000	3.5	23.7	0.4	0.01	0.02	
SD-06	98374	08/19/86	10.20	240	--	--	--	--	--	--	--	44.6	--	--	--	--	
SD-07	98424	08/21/86	9.20	56	5.7	U 0.5	9	U 0.5	72	38000	51	8.8	71.9	--	--	--	--
SD-08	98424	08/21/86	8.80	30	--	--	--	--	--	--	--	70.7	--	--	--	--	
SD-09	98374	08/19/86	9.00	1000	37.0	3.9	920	4.2	860	41000	4200	7.4	23.8	0.4	U 0.01	0.02	U 0.1

8 = mg MII/100 gm (air dried)
U: preceding a number indicates concentration below detection limit. Value shown is detection limit.

655

Dames & Moore

Gould

APPENDIX A-8

SEDIMENT CHEMISTRY DATA

SITE 13 - RIEDEL ENVIRONMENTAL SERVICES

Kicel

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Maui Foster & Associates
Project: Zidell
Sample Matrix: Soil

Service Request: K9605476
Date Collected: 9/3/96
Date Received: 9/4/96

Total Solids

Prep Method: NONE
Analysis Method: 160.3M
Test Notes:

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
SED1-090396-1.2	K9605476-001	9/9/96	48.7	
SED2-090396-1.6	K9605476-002	9/9/96	46.8	
SED3-090396-0.6	K9605476-003	9/9/96	66.3	
SED4-090396-1.4	K9605476-004	9/9/96	53.0	
SEDS-090396-1.2	K9605476-005	9/9/96	51.6	
SED6-090396-1.1	K9605476-006	9/9/96	50.9	
SED7-090396-0.8	K9605476-007	9/9/96	53.7	

pproved By: _____

J
al Salida 060595
05476MAAMI - Sample 9/10/96

Date: 9/10/96 00003

Page No. 1

097

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Maul Foster & Associates
Project: Zidell
Sample Matrix: Soil

Service Request: K9605476
Date Collected: 9/3/96
Date Received: 9/4/96
Date Extracted: 9/12/96

Total Metals
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name:	SED1-090396-1.2	SED2-090396-1.6	SED3-090396-0.6
Lab Code:	K9605476-001	K9605476-002	K9605476-003
Date Analyzed:	9/13/96	9/13/96	9/13/96

Analyte	EPA Method	MRL			
Antimony	6010A	10	ND	ND	ND
Arsenic	7060	1	5	4	21
Beryllium	6010A	1	ND	ND	ND
Cadmium	6010A	1	ND	ND	ND
Chromium	6010A	2	38	41	25
Lead	6010A	20	ND	ND	ND
Nickel	6010A	10	87	33	18

Approved By: _____ Date: 9/20/96 00004

JSS/EPA/102094
 05476ICP/JC1 - Sample 9/19/96

Page No..

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Maul Foster & Associates
 Project: Zidell
 Sample Matrix: Soil

Service Request: K9605476
 Date Collected: 9/3/96
 Date Received: 9/4/96
 Date Extracted: 9/12/96

Total Metals

Units: mg/Kg (ppm)

Dry Weight Basis

Sample Name: SED3-090396-1.4 SED5-090396-1.2 SED6-090396-1.1
 Lab Code: K9605476-004 K9605476-005 K9605476-006
 Date Analyzed: 9/13/96 9/13/96 9/13/96

Analyte	EPA Method	MRL			
Antimony	6010A	10	ND	ND	ND
Arsenic	7060	1	35	10	6
Beryllium	6010A	1	ND	ND	ND
Cadmium	6010A	1	ND	ND	ND
Chromium	6010A	2	42	54	44
Lead	6010A	20	60	38	45
Nickel	6010A	10	27	34	29

Approved By:

3S30EPA/102094
05476ICP JCI - Sample (2) 9/19/96

999

Date:

9/20/96

00005

Page No.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Maul Foster & Associates
Project: Zidell
Sample Matrix: Soil

Service Request: K9605476
Date Collected: 9/3/96
Date Received: 9/4/96
Date Extracted: 9/12/96

Total Metals
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name: SED7-090396-0.8 Method Blank
Lab Code: K9605476-007 K9605476-MB
Date Analyzed: 9/13/96 9/13/96

Analyte	EPA Method	MRL		
Antimony	6010A	10	ND	ND
Arsenic	7060	1	4	ND
Beryllium	6010A	1	ND	ND
Cadmium	6010A	1	ND	ND
Chromium	6010A	2	38	ND
Lead	6010A	20	ND	ND
Nickel	6010A	10	29	ND

Approved By:

3S30EPA/102094
05476(ICP JC1) - Sample (3) 9/19/96

Jc Date: 9/20/96

00006

Page No

100-223

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Manl Foster & Associates
Project: Zidell
Sample Matrix: Soil

Service Request: K9605476
Date Collected: 9/3/96
Date Received: 9/4/96
Date Extracted: 9/9/96

Polychlorinated Biphenyls (PCBs)
EPA Methods 3540B/8080A
Units: mg/Kg (ppm)
Dry Weight Basis

	Sample Name: Lab Code:	SED1-090396-1.2 K9605476-001(F)	SED2-090396-1.6 K9605476-002(F)	SED3-090396-0.6 K9605476-003
Date Analyzed:		9/13/96	9/13/96	9/13/96

Analyte	MRL			
Aroclor 1016	0.1	<0.2	<0.2	ND
Aroclor 1221	0.1	<0.2	<0.2	ND
Aroclor 1232	0.1	<0.2	<0.2	ND
Aroclor 1242	0.1	<0.2	<0.2	ND
Aroclor 1248	0.1	<0.2	<0.2	ND
Aroclor 1254	0.1	<0.2	<0.2	ND
Aroclor 1260	0.1	<0.2	<0.2	ND

F

The MRL is elevated because of the low percent solids in the sample as received.

Approved By:

Wanda J. Neffel

Date: 9/18/96

00007

3S22/120594
05476SVGJS1 - 1-3 9/18/96

Page No

101 *100*

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Maul Foster & Associates
Project: Zidell
Sample Matrix: Soil

Service Request: K9605476
Date Collected: 9/3/96
Date Received: 9/4/96
Date Extracted: 9/9/96

Polychlorinated Biphenyls (PCBs)
EPA Methods 3540B/8080A
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name:	SED4-090396-1.4	SEDS-090396-1.2	SED6-090396-1.1
Lab Code:	K9605476-004(F)	K9605476-005(F)	K9605476-006(F)
Date Analyzed:	9/13/96	9/13/96	9/13/96

Analyte	MRL			
Aroclor 1016	0.1	<0.2	<0.2	<0.2
Aroclor 1221	0.1	<0.2	<0.2	<0.2
Aroclor 1232	0.1	<0.2	<0.2	<0.2
Aroclor 1242	0.1	<0.2	<0.2	<0.2
Aroclor 1248	0.1	<0.2	<0.2	<0.2
Aroclor 1254	0.1	<0.2	<0.2	<0.2
Aroclor 1260	0.1	<0.2	<0.2	<0.2

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By:

Wanda J. Negele

3S22/120594
05476SVGJS1 - 4-6 9/18/96

Date: 9/18/96

00008

Page No.:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Maui Foster & Associates
Project: Zidell
Sample Matrix: Soil

Service Request: K9605476
Date Collected: 9/3/96
Date Received: 9/4/96
Date Extracted: 9/9/96

Polychlorinated Biphenyls (PCBs)
EPA Methods 3540B/8080A
Units: mg/Kg (ppm)
Dry Weight Basis

Sample Name:	SED7-090396-0.8	Method Blank
Lab Code:	K9605476-007(F)	K960909-MB
Date Analyzed:	9/13/96	9/12/96

Analyte **MRL**

Aroclor 1016	0.1	<0.2	ND
Aroclor 1221	0.1	<0.2	ND
Aroclor 1232	0.1	<0.2	ND
Aroclor 1242	0.1	<0.2	ND
Aroclor 1248	0.1	<0.2	ND
Aroclor 1254	0.1	<0.2	ND
Aroclor 1260	0.1	<0.2	ND

F

The MRL is elevated because of the low percent solids in the sample as received.

Approved By:

3522/120594
05476SVGJS1 -7,MB 9/18/96

Wanda J. Nagel

Date: 9/18/96

00009

Page No..

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Maul Foster & Associates
 Project: Zidell
 Sample Matrix: Soil

Service Request: K9605476
 Date Collected: 9/3/96
 Date Received: 9/4/96
 Date Extracted: 9/6/96

Butyltins*
 Units: µg/Kg (ppb)
 Dry Weight Basis

Method Reporting Limit:	Analyte:	Tributyltin	Dibutyltin	Butyltin
-------------------------	----------	-------------	------------	----------

Sample Name	Lab Code	Date Analyzed			
SED1-090396-1.2	K9605476-001	9/13/96	ND	ND	ND
SED2-090396-1.6	K9605476-002	9/13/96	7	ND	ND
SED3-090396-0.6	K9605476-003	9/13,16/96	18000	320	8
SED4-090396-1.4	K9605476-004	9/13,16/96	32000	470	8
SED5-090396-1.2	K9605476-005	9/13/96	970	53	ND
SED6-090396-1.1	K9605476-006	9/13,16/96	2600	150	ND
SED7-090396-0.8	K9605476-007	9/13/96	4	ND	ND
Method Blank	K9600906-MB	9/13/96	ND	ND	ND

* Methodology based on C.A.Krone, et al., "A Method for Analysis of Butyltin Species and Measurement of Butyltins in Sediment and English Sole Livers from Puget Sound," National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Seattle, WA, November 1988.

Approved By:

IADA/101194
 05476SVG.DDI - Butyltin 9/19/96

Date: 9/19/96

00010

Page No.

APPENDIX A-9

SEDIMENT CHEMISTRY DATA

SITE 15 - PORT OF PORTLAND -- SHIP REPAIR YARD

SITE ID: 271 Port of Portland - Ship Repair Yard

SITE SUMMARY REPORT

significant sediment contamination remains in the Willamette River, especially around Drydocks #1 and #3. may be widespread as a result of facility operations.

PATHWAYS:

Sediment contamination can be stirred up by river currents and seasonal changes in the elevation of the Willamette River, and thereby leach contaminants into the river.

SUBSTANCE CONTAMINATION

<u>SUBSTANCE</u>	<u>MEDIA CONTAMINATED</u>	<u>CONCENTRATION LEVEL</u>	<u>EVIDENCE</u>	<u>OBSERV. DATE</u>
ARSENIC	> Sediment	640 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	27-SEP-90
BENZO(a)ANTHRACENE	> Sediment	1.2 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
BENZO(a)PYRENE	> Sediment	1 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
BENZO(b)FLUORANTHENE	> Sediment	1.3 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
CADMIUM	> Sediment	8 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	27-SEP-90
CHROMIUM	> Sediment	95 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
CHRYSENE	> Sediment	1.4 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
COPPER	> Sediment	506 ppm > Sediment	Laboratory Data	17-DEC-92
	2,200 ppm Other dry docks		Laboratory Data	15-DEC-94
	Date released: continuous practice; specific dates unknown. Quantity Released: unknown			2/10/91

SITE ID: 271

Port of Portland - Ship Repair Yard

SITE SUMMARY REPORT

FLUORANTHENE	> Sediment 2.7 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
INDENO(1,2,3-cd) PYRENE	> Sediment 0.67 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
LEAD	> Sediment 670 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	27-SEP-90
MERCURY	> Sediment 2.1 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
OIL OR FUEL RELATED COMPOUNDS	Surface Water See comment Date released: 11-14-87 Quantity Released: unknown Data Source: EPA inspector observation on day of release; DEQ NOV 1-19-88		
PCBs	> Sediment 0.71 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
PHENANTHRENE	> Sediment 2.6 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
PYRENE	> Sediment 2.8 ppm Date released: continuous Quantity Released: unknown	Laboratory Data	15-DEC-94
TIN	Surface Water 0.018 ppm Sediment 17.6 ppm Date released: continuous Quantity Released: unknown General Comments: (Tributyl tin)	Laboratory Data Laboratory Data	14-DEC-92 15-DEC-92
ZINC	> Sediment 7,000 ppm > Sediment 369 ppm Other dry dock Date released: continuous Quantity Released: unknown	Laboratory Data Laboratory Data	27-SEP-90 17-DEC-92

MEDIA CONTAMINATION COMMENTS:

Table 2 - Drydock No. 3 - Post-Dredge Analytical Results

Hart Crowser

J-5612

Sheet 1 of 4

Lab ID	412-1332	412-1333	412-1334	412-1326	412-1327
Sample ID	DD3-C1B	DD3-C2B	DD3-C3B	DD3-S1	DD3-S2
Group	Post-Dredging	Post-Dredging	Post-Dredging	Post-Dredging	Post-Dredging
Sampling Date	12/15/94	12/15/94	12/15/94	12/15/94	12/15/94
Metals in mg/kg					
Antimony	3.5	4.4	4	1.3	2.8
Arsenic	140	52	78	18	63
Cadmium	1.2	0.92	0.93	0.32	0.54
Chromium	42	54	95	30	48
Copper	1500	1800	2200	610	1400
Lead	97	140	330	52	84
Mercury	0.22	2.1	1.3	0.24	0.88
Nickel	24	27	30	17	23
Silver	0.8	0.56	0.81	0.25	0.36
Zinc	1500	1500	1400	360	610
Butyltins as Ion in µg/kg					
Tributyltin as Ion				4300	5800
Pesticide/PCBs in µg/kg					
4,4'-DDD					1 U
4,4'-DDE					1 U
4,4'-DDT					3 U
Aroclor 1254					510
Aroclor 1260					200
Total PCBs					710
Chlordane					1 U
Dieldrin					2 U
Endrin					2 U
Endrin Aldehyde					3 U
Gamma-BHC(Lindane)					1 U
Heptachlor Epoxide					0.8 U
Semivolatiles in µg/kg					
1,4-Dichlorobenzene	50 U	50 U	50 U	230	50 U
2,4-Dinitrotoluene	50 U	50 U	50 U	260	50 U
2-Methylnaphthalene	54	210	220	50 U	110
4-Methylphenol	50 U	97	89	50 U	50 U
Acenaphthene	94	380	430	120	190
Anthracene	250 U	530	630	250 U	300
Benzo(a)anthracene	260	880	1200	420	520
Benzo(a)pyrene	220	770	1000	340	440
Benzo(b)fluoranthene	310	1000	1300	440	600
Benzo(g,h,i)perylene	130	430	610	210	270
Benzo(k)fluoranthene	140	440	570	250	290

Table 2 - Drydock No. 3 - Post-Dredge Analytical Results

Hart Crowser

J-5612

Sheet 2 of 4

Lab ID	412-1332	412-1333	412-1334	412-1326	412-1327
Sample ID	DD3-C1B	DD3-C2B	DD3-C3B	DD3-S1	DD3-S2
Group	Post-Dredging	Post-Dredging	Post-Dredging	Post-Dredging	Post-Dredging
Sampling Date	12/15/94	12/15/94	12/15/94	12/15/94	12/15/94
Bis(2-ethylhexyl)Phthalate	1100	1400	1900	1100	750
Butylbenzyl Phthalate	50 U	140	110	50 U	50 U
Carbazole	71	230	260	74	130
Chrysene	320	1000	1400	490	590
Di-n-butyl Phthalate	250 U	110	250 U	250 U	250 U
Dibenz(a,h)anthracene	50 U	110	150	55	76
Dibenzofuran	71	270	360	83	140
Dimethyl Phthalate	50 U	50 U	99	50 U	50 U
Fluoranthene	750	2200	2700	1000	1400
Fluorene	130	430	570	140	230
Hexachlorobenzene	50 U	50 U	50 U	440	50 U
Hexachlorobutadiene	50 U	50 U	50 U	230	50 U
Hexachlorocyclopentadiene	50 U				
Hexachloroethane	50 U	50 U	50 U	210	50 U
Indeno(1,2,3-c,d)pyrene	130	450	670	210	300
Isophorone	50 U				
N-Nitrosodi-n-propylamine	50 U				
N-Nitrosodiphenylamine	50 U				
Naphthalene	52	220	260	54	120
Nitrobenzene	50 U	50 U	50 U	300	50 U
Pentachlorophenol	250 U				
Phenanthrene	760	2300	2600	880	1300
Pyrene	550	1800	2800	780	1000
Volatiles in µg/kg					
2-Butanone				500 U	500 U
Acetone				500 U	500 U
Benzene				100 U	100 U
Chlorobenzene				100 U	100 U
Ethylbenzene				2000	1000
Total Xylenes				3200	2300

Table 2 - Drydock No. 3 - Post-Dredge Analytical Results

Hart Crowser
J-5612
Sheet 3 of 4

Lab ID	412-1328	412-1329	412-1330	412-1331
Sample ID	DD3-S3	DD3-S4	DD3-S5	DD3-S6
Group	Post-Dredging	Post-Dredging	Post-Dredging	Post-Dredging
Sampling Date	12/15/94	12/15/94	12/15/94	12/15/94
Metals in mg/kg				
Antimony	1.4	6.5	2	1.9
Arsenic	20	98	22	33
Cadmium	0.69	0.9	0.7	0.87
Chromium	49	58	50	50
Copper	1100	2000	1300	1600
Lead	110	200	120	140
Mercury	1.4	0.6	0.66	1.5
Nickel	27	25	25	28
Silver	0.51	0.46	0.63	0.56
Zinc	760	2700	880	780
Butyltins as Ion in µg/kg				
Tributyltin as Ion	9600	7400	5700	9600
Pesticide/PCBs in µg/kg				
4,4'-DDD	1 U	1 U	1 U	1 U
4,4'-DDE	1 U	1 U	1 U	1 U
4,4'-DDT	3 U	3 U	3 U	3 U
Aroclor 1254	740	390	460	400
Aroclor 1260	270	130	150	970
Total PCBs	1010	520	610	1370
Chlordane	1 U	1 U	1 U	1 U
Dieldrin	2 U	2 U	2 U	2 U
Endrin	2 U	2 U	2 U	2 U
Endrin Aldehyde	3 U	3 U	3 U	3 U
Gamma-BHC(Lindane)	1 U	1 U	1 U	1 U
Heptachlor Epoxide	0.8 U	0.8 U	0.8 U	0.8 U
Semivolatiles in µg/kg				
1,4-Dichlorobenzene	50 U	50 U	50 U	50 U
2,4-Dinitrotoluene	50 U	50 U	50 U	50 U
2-Methylnaphthalene	50 U	50 U	50 U	110
4-Methylphenol	50 U	50 U	50 U	51
Acenaphthene	100	100	100	220
Anthracene	250 U	250 U	250 U	340
Benzo(a)anthracene	320	330	280	640
Benzo(a)pyrene	290	280	260	560
Benzo(b)fluoranthene	390	380	340	700
Benzo(g,h,i)perylene	140	150	150	330
Benzo(k)fluoranthene	180	210	150	370

Table 2 - Drydock No. 3 - Post-Dredge Analytical Results

Hart Crowser
J-5612
Sheet 4 of 4

Lab ID	412-1328	412-1329	412-1330	412-1331
Sample ID	DD3-S3	DD3-S4	DD3-S5	DD3-S6
Group	Post-Dredging	Post-Dredging	Post-Dredging	Post-Dredging
Sampling Date	12/15/94	12/15/94	12/15/94	12/15/94
Bis(2-ethylhexyl)Phthalate	730	1500	670	1200
Butylbenzyl Phthalate	50 U	50 U	50 U	71
Carbazole	60	64	61	130
Chrysene	410	420	340	730
Di-n-butyl Phthalate	250 U	250 U	250 U	250 U
Dibenz(a,h)anthracene	50 U	50 U	50 U	78
Dibenzofuran	71	67	66	150
Dimethyl Phthalate	50 U	50 U	50 U	50 U
Fluoranthene	810	810	780	1600
Fluorene	110	120	110	260
Hexachlorobenzene	50 U	50 U	50 U	50 U
Hexachlorobutadiene	50 U	50 U	50 U	50 U
Hexachlorocyclopentadiene	50 U	50 U	50 U	50 U
Hexachloroethane	50 U	50 U	50 U	50 U
Indeno(1,2,3-c,d)pyrene	130	150	140	350
Isophorone	50 U	50 U	50 U	50 U
N-Nitrosodi-n-propylamine	50 U	50 U	50 U	50 U
N-Nitrosodiphenylamine	50 U	50 U	50 U	50 U
Naphthalene	50 U	50 U	63	120
Nitrobenzene	50 U	50 U	50 U	50 U
Pentachlorophenol	250 U	250 U	250 U	250 U
Phenanthrene	760	740	730	1500
Pyrene	710	730	550	1200
Volatiles in µg/kg				
2-Butanone	20 U	44	20 U	20 U
Acetone	200	310	310	71
Benzene	4 U	4 U	7.3	4.8
Chlorobenzene	8.8	4 U	4 U	10
Ethylbenzene	12	53	32	280
Total Xylenes	22	96	83	430

U Not detected at indicated detection limit

Table 3 - Drydock No. 4 - Post-Dredge Analytical Results

Hart Crowser

J-5612

Sheet 1 of 4

Lab ID	K7832-1	K7832-2	K7832-3	K7832-4	K7832-5
Sample ID	1	2	3	4	5
Group	Post-Dredging	Post-Dredging	Post-Dredging	Post-Dredging	Post-Dredging
Sampling Date	12/15/92	12/15/92	12/15/92	12/15/92	12/15/92
Metals in mg/kg					
Antimony	0.22	0.39	0.22	0.03	0.15
Arsenic	8.1	11.7	8.4	3.7	7.5
Cadmium	0.32	0.36	0.22	0.21	0.28
Chromium	27.8	24.6	22.2	23.3	20.9
Copper	417	506	185	91.6	278
Lead	46.6	48.7	26.4	24.7	35.1
Mercury	0.07	0.1	0.06	0.08	0.08
Nickel	23.8	19.8	23.4	19.6	18.2
Silver	0.31	0.4	0.27	0.36	0.34
Zinc	259	369	215	131	221
Butyltins as Ion in µg/kg					
Dibutyltin	583	1030	326	188	651
Monobutyltin	49.8	97.1	43.3	8 U	39.2
Tributyltin	11100	17600	4540	3010	12900
Pesticide/PCBs in µg/kg					
4,4'-DDD	4 U	5 U	4 U	4 U	5 U
4,4'-DDE	4 U	5 U	4 U	4 U	5 U
4,4'-DDT	4 U	5 U	4 U	4 U	5 U
Total PCBs	100 U				
Chlordane	10 U				
Dieldrin	4 U	5 U	4 U	4 U	5 U
Endrin	4 U	5 U	4 U	4 U	5 U
Gamma-BHC(Lindane)	200 U	200 U	1 U	1 U	1 U
Heptachlor Epoxide	4 U	5 U	4 U	4 U	5 U
Semivolatiles in µg/kg					
2-Methylnaphthalene	77	110	70 U	64 U	60 U
3/4-Methylphenol				47	30
Acenaphthene	160	230	70 U	64 U	94
Anthracene	330	450	120	91	180
Benzo(a)anthracene	610	810	190	150	330
Benzo(a)pyrene	560	850	220	180	330
Benzo(g,h,i)perylene	230	400	120	110	170
Bis(2-ethylhexyl)Phthalate	3900	3700	3100	1900	2000
Butylbenzyl Phthalate	62 U	150	100	160	170
Chrysene	570	980	170	150	290
Di-n-butyl Phthalate	100	230	70 U	64 U	97
Dibenz(a,h)anthracene	62 U	75 U	70 U	64 U	69

Table 3 - Drydock No. 4 - Post-Dredge Analytical Results

Hart Crowser

J-5612

Sheet 2 of 4

Lab ID Sample ID Group Sampling Date	K7832-1 1 Post-Dredging 12/15/92	K7832-2 2 Post-Dredging 12/15/92	K7832-3 3 Post-Dredging 12/15/92	K7832-4 4 Post-Dredging 12/15/92	K7832-5 5 Post-Dredging 12/15/92
Dibenzofuran	120	160	70 U	64 U	64
Fluoranthene	1400	2400	570	370	960
Fluorene	220	310	77	64 U	120
Indeno(1,2,3-c,d)pyrene	270	610	170	130	220
Naphthalene	63	100	70 U	64 U	68
Phenanthrene	1400	2000	500	270	810
Pyrene	1100	2000	470	320	800
Total Benzofluoranthenes	900	1400	320	280	520
Volatiles (EPA Method 8240) in µg/kg					
Ethylbenzene	8	60	5 U	5 U	5 U
Total Xylenes	68	390	28	18	48

Table 3 - Drydock No. 4 - Post-Dredge Analytical Results

Hart Crowser
J-5612
Sheet 3 of 4

Lab ID	K7832-6	K7832-7	K7832-8
Sample ID	6	7	8
Group	Post-Dredging	Post-Dredging	Post-Dredging
Sampling Date	12/15/92	12/15/92	12/15/92
Metals in mg/kg			
Antimony	0.14	0.06	0.25
Arsenic	7.3	4.7	10.3
Cadmium	0.22	0.25	0.32
Chromium	20.3	24.8	24.4
Copper	280	136	269
Lead	28.3	30.3	49.5
Mercury	0.07	0.08	0.13
Nickel	17.2	20	19.6
Silver	0.25	0.38	0.46
Zinc	201	159	307
Butyltins as Ion in µg/kg			
Dibutyltin	428	266	353
Monobutyltin	26.5	24.3	8 U
Tributyltin	9850	3960	7900
Pesticide/PCBs in µg/kg			
4,4'-DDD	3 U	6 U	9 U
4,4'-DDE	3 U	6 U	9 U
4,4'-DDT	3 U	6 U	9 U
Total PCBs	100 U	100 U	100 U
Chlordane	10 U	10 U	10 U
Dieldrin	3 U	6 U	9 U
Endrin	3 U	6 U	9 U
Gamma-BHC(Lindane)	200 U	200 U	200 U
Heptachlor Epoxide	3 U	6 U	9 U
Semivolatiles in µg/kg			
2-Methylnaphthalene	74		
3/4-Methylphenol	23	47	45
Acenaphthene	130		
Anthracene	1100		
Benzo(a)anthracene	380		
Benzo(a)pyrene	330		
Benzo(g,h,i)perylene	220		
Bis(2-ethylhexyl)Phthalate	2100		
Butylbenzyl Phthalate	89		
Chrysene	450		
Di-n-butyl Phthalate	96		
Dibenz(a,h)anthracene	85		

Table 3 - Drydock No. 4 - Post-Dredge Analytical Results

Hart Crowser
J-5612
Sheet 4 of 4

Lab ID	K7832-6	K7832-7	K7832-8
Sample ID	6	7	8
Group	Post-Dredging	Post-Dredging	Post-Dredging
Sampling Date	12/15/92	12/15/92	12/15/92
Dibenzofuran	97		
Fluoranthene	1100		
Fluorene	210		
Indeno(1,2,3-c,d)pyrene	310		
Naphthalene	62		
Phenanthrene	1100		
Pyrene	930		
Total Benzofluoranthenes	650		
Volatiles (EPA Method 8240) in			
Ethylbenzene	5 U	5 U	5 U
Total Xylenes	54	13	23

U Not detected at indicated detection limit

Table 5 - Berth 311 Analytical Results

Hart Crowser

J-5612

Sheet 1 of 2

Lab ID	1B/2B	1S/2S	3B/4B	3S/4S	5S/6S
Sample ID	1B/2B	1S/2S	3B/4B	3S/4S	5S/6S
Sampling Date	9/27/90	9/27/90	9/27/90	9/27/90	9/27/90
Metals in mg/kg					
Arsenic	1.5	1.5	1.7	1.3	4
Cadmium	0.6	0.6	0.6	0.4	0.6
Chromium	13	14	15	12	15
Copper	23	22	26	21	37
Lead	13	12	13	11	13
Mercury	0.08	0.04	0.06	0.12	0.1
Nickel	11	11	12	11	12
Zinc	74	71	68	61	90
Butyltins as Ion in µg/kg					
Dibutyltin					
Monobutyltin					
Tributyltin					
Pesticide/PCBs in µg/kg					
4,4'-DDD	100 U				
4,4'-DDE	20 U				
4,4'-DDT	100 U				
Aroclor 1254	250 U				
Total PCBs	250 U				
Chlordane	100 U				
Dieldrin	20 U				
Endrin	40 U				
Gamma-BHC(Lindane)	20 U				
Heptachlor Epoxide	500 U				
Semivolatiles in µg/kg					
4-Methylphenol	300 U	300 U	340	370	300 U
Acenaphthene	300 U				
Benzo(a)anthracene	300 U				
Benzo(a)pyrene	300 U				
Benzo(b)fluoranthene	300 U				
Benzo(g,h,i)perylene	300 U				
Chrysene	300 U				
Di-n-butyl Phthalate	2500	1800	1600	1500 U	1500 U
Dibenz(a,h)anthracene	300 U				
Fluoranthene	300 U				
Indeno(1,2,3-c,d)pyrene	300 U				
Pentachlorophenol	300 U				
Phenanthrene	300 U	300 U	300 U	300 U	450
Pyrene	300 U	300 U	300 U	300 U	680
Total Benzofluoranthenes					

Table 5 - Berth 311 Analytical Results

Hart Crowser

J-5612

Sheet 2 of 2

Lab ID	7S	K2252-3	K2252-1	K2252-4	K2252-2
Sample ID	7S	3&4 Bottom	3&4 Surface	5&6 Bottom	5&6 Surface
Sampling Date	9/27/90	4/09/92	4/09/92	4/09/92	4/09/92
Metals in mg/kg					
Arsenic	640				
Cadmium	8				
Chromium	40				
Copper	1200				
Lead	670				
Mercury	0.02				
Nickel	13				
Zinc	7000				
Butyltins as Ion in µg/kg					
Dibutyltin		2.4 U	2.1 J	1.7 J	9.6
Monobutyltin		1.7 J	2 J	2.2 J	2.1 J
Tributyltin		4.9	18.2	10	105.7
Pesticide/PCBs in µg/kg					
4,4'-DDD	100 U	5 U	5 U	5 U	5 U
4,4'-DDE	20 U	5 U	5 U	5 U	5 U
4,4'-DDT	100 U	5 U	5 U	5 U	5 U
Aroclor 1254	250 U	17	90	160	140
Total PCBs	250 U	17	90	160	140
Chlordane	100 U	10 U	10 U	10 U	10 U
Dieldrin	20 U	5 U	5 U	5 U	5 U
Endrin	40 U	5 U	5 U	5 U	5 U
Gamma-BHC(Lindane)	20 U	1 U	1 U	1 U	1 U
Heptachlor Epoxide	500 U	5 U	5 U	5 U	5 U
Semivolatiles in µg/kg					
4-Methylphenol	300 U	140	240	84	130
Acenaphthene	300 U	65 U	85 U	70	85 U
Benzo(a)anthracene	600	83	97	230	160
Benzo(a)pyrene	300 U	90	130	310	180
Benzo(b)fluoranthene	360				
Benzo(g,h,i)perylene	300 U	97	120	330	85 U
Chrysene	720	95	110	250	180
Di-n-butyl Phthalate	1500 U				
Dibenz(a,h)anthracene	300 U	65 U	85 U	65 U	150
Fluoranthene	300 U	210	300	730	490
Indeno(1,2,3-c,d)pyrene	300 U	87	96	290	160
Pentachlorophenol	300 U	160 U	210 U	180	210 U
Phenanthrene	750	140	180	430	240
Pyrene	1600	240	340	950	530
Total Benzofluoranthenes		170	210	430	330

U Not detected at indicated detection limit

J Estimated value

APPENDIX A-10

SEDIMENT CHEMISTRY DATA

Reference

Willamette River Toxics Study 1988-1991, DEQ Water Quality Division (Gene Foster & Barbara Stifel), 7/94.

Summary: Sediment Metals Analyses

River	Station	River Mile	Date	Metals (mg/kg)							
				Total Arsenic	Total Cadmium	Total Chromium	Total Copper	Total Lead	Total Mercury	Total Zinc	
1988 — 1989 Analytical Results											
Willamette	St. John's Bridge	6	10-Aug-88	45.5	0.9	43.2	47.5	35.7	0.03	159	
	SP&S Bridge	7 North	26-Oct-89	4.47	0.07j	11.9	15.7	19j	0.034	75.9	
		7 South	26-Oct-89	4.99	0.16j	22	19.2	23.5	0.087	87	
			15-Aug-88	18.6	0.5u	20.4	31.1	33.9	0.03	121	
	Doane Lake	7	10-Aug-88	54	0.5u	32.9	53.9	25.2	0.13	160	
	Swan Island	8	26-Oct-89	5.39	0.617	27.5	197	35.1	0.092	214	
		8,1A	26-Jan-88	3.9	0.5u	31.1	89.1	20.6	0.106	231	
		8,1B	26-Jan-88	4.6	0.5u	38.8	101	30.5	0.139	272	
		8,2A	26-Jan-88	14.5	0.5u	90.8	320	151	1.74	703	
	Ross Island	14	26-Oct-89	2.33	0.092j	18.9	14.6	12.4	0.033	73.2	
	Sellwood Bridge	16	15-Aug-88	14.8	0.5u	25.3	32.3	22.8	0.03	107	
	Johnson Creek	18	26-Oct-89	2.98	0.13j	26.7	20.6	20j	0.03	72.3	
	DS Oregon City	27	25-Oct-89	3.73	0.19j	32.9	25.6	8.5j	0.034	75.6	
		10-Aug-88	42.6	0.5u	26	28	5.7	0.008u	70.5		
	Wilsonville		04-Oct-89	2.62	0.19j	28.2	26	11j	0.028	71.8	
			15-Aug-88	18	0.5u	20.6	23.4	13.6	0.008u	72.6	
	Newberg Pool	47	25-Oct-89	2.97	0.12j	28.5	23.7	13j	0.018	63.8	
	Newberg	48	15-Aug-88	19.7	0.5u	17.6	20.6	11.1	0.008u	62.5	
	US Newberg Pool	52	25-Oct-89	3.15	0.18j	24.6	22.6	9.9j	0.034	67.6	
Columbia Slough	BL Mouth of North Slough	1	26-Oct-89	4.41	0.285	14.9	7.99	16j	0.031	69.4	
	15-Aug-88	21.2	1.4	38.9	44.7	60	0.05	187			
	Dump Road	2	15-Aug-88	13	0.5	19.4	19.5	52.6	0.05	142	
	Denver Avenue	5	15-Aug-88	26.6	2.1	61.4	65.8	118	0.1	324	
Tualatin	Tualatin	8	27-Oct-89	3.98	0.54	31.5	21	21.6j	0.048	109	
			14-Nov-88	2.8	0.5	19.2	30.5	28	0.014	86.4	
Fanno Creek	—	2	15-Nov-89	3.86	0.592	21.2	17.7	29.6	0.041	149	
			09-Nov-88	3.4	0.5	22.2	19.4	36	0.015	148	
Beaverton Creek	—	4	15-Nov-89	8.77	4.5j	186	331	283	0.3	398	
			09-Nov-88	3.1	0.5	32.7	47.8	50.7	0.062	114	
Yamhill	—	5	27-Oct-89	5.25	0.234	29.8	25.8	11j	0.018	80.3	
			15-Aug-88	29.6	0.5u	27.2	39.4	17.1	0.008u	87	
Conser Slough	—	0.1	05-Oct-89	3.39	0.16j	25.3	20.5	15j	0.065	74.7	

LEGEND:

u = Material was analyzed for but not detected.

j = Estimated value; value not accurate.

Summary: Sediment PCB Analyses

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River	Station	River Mile	Sample Date	Chemicals										
				3,3'4,4' TCBP (mg/kg)	2,3,3',4,4'PCBP (mg/kg)	3,3',4,4'5 PCBP (mg/kg)	3,3',4,4',5,5' HCBP (mg/kg)	PCB 1 (1221) (mg/kg)	PCB 2 (1232) (mg/kg)	PCB 3 (1242) (mg/kg)	PCB 4 (1254) (mg/kg)	PCB 5 (1260) (mg/kg)	TOC (mg/kg - Wet)	
Willamette	St. John's Bridge	6	10-Aug-88	NA	NA	NA	NA	0.06u	0.06u	0.06u	0.06u	0.35	5100	
	SP&S Bridge	7	12-Jun-90	0.005u	0.005u	0.005u	0.005u	0.125u	0.005u	0.025u	0.025u	0.003u	7040	
			12-Jun-90	0.005u	0.005u	0.005u	0.005u	0.125u	0.005u	0.025u	0.025u	0.003u	6410	
		7 North	26-Oct-89	NA	NA	NA	NA	0.04u	0.04u	0.04u	0.04u	0.04u	5000	
	7 South	26-Oct-89	NA	NA	NA	NA	0.12u	0.12u	0.12u	0.12u	0.12u	12000		
			15-Aug-88	NA	NA	NA	NA	0.015u	0.015u	0.015u	0.015u	0.015u	41900	
	Doane Lake	7	10-Aug-88	NA	NA	NA	NA	0.06u	0.06u	0.06u	0.06u	0.05	29900	
	Pennwalt	7												
	Swan Island	8	26-Oct-89	NA	NA	NA	NA	0.045u	0.045u	0.045u	0.25j	0.045u		
		8,1A	26-Jan-88	NA	NA	NA	NA	0.05u	0.05u	0.05u	0.05u	0.26		
		8,1B	26-Jan-88	NA	NA	NA	NA	0.05u	0.05u	0.05u	0.05u	0.05u		
		8,2A	26-Jan-88	NA	NA	NA	NA	0.2u	0.2u	0.2u	4.2	0.2u		
	Ross Island	14	26-Oct-89	NA	NA	NA	NA	0.045u	0.045u	0.045u	0.045u	0.045u	2000	
	Sellwood Bridge	16	15-Aug-88	NA	NA	NA	NA	0.015u	0.015u	0.015u	0.015u	0.015u	37900	
	Johnson Creek	18	16-Oct-89	NA	NA	NA	NA	0.05u	0.05u	0.05u	0.05u	0.05u	22000	
	Down Stream Oregon City	27	25-Oct-89	NA	NA	NA	NA	0.062u	0.062u	0.062u	0.062u	0.062		
			10-Aug-88	NA	NA	NA	NA	0.03u	0.03u	0.03u	0.03u	0.03u	6200	
	Up Stream Oregon City	28											29000	
	Wilsonville	38	04-Oct-89	NA	NA	NA	NA	0.05u	0.05u	0.05u	0.05u	0.05u		
			15-Aug-88	NA	NA	NA	NA	0.013u	0.013u	0.013u	0.013u	0.013u	6100	
	Newberg Pool	47	25-Oct-89	NA	NA	NA	NA	0.06u	0.06u	0.06u	0.06u	0.06u	19000	
	Newberg	48	15-Aug-88	NA	NA	NA	NA	0.013u	0.013u	0.013u	0.013u	0.013u	18800	

Summary: Sediment Pesticide Analyses

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River	Station	River Mile	Sample Date	Chemicals																				Total Weight			
				Aroclor 1242 ppm	BHC ppm	Heptachlor ppm	Heptachlor epoxide ppm	Heptachloroethane ppm	Heptachloroethene ppm	Heptachloroethyne ppm																	
Willamette	St. John's Bridge	8	10 Aug 88	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.012u	0.012u	0.18u	5100	
			23 Aug 88	0.005u	0.018	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	0.025u	7040	
	SP&S Bridge	7	23 Aug 88	0.006	0.007	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	0.025u	6410
			23 Aug 88	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.025u	0.025u	0.025u	8970	
			7 North	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.004u	0.12u	5000	
	7 South	7	28 Oct 88	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.012u	0.36u	12000	
			15 Aug 88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.045u	41900		
	Deane Lake	7	10 Aug 88	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.006u	0.021	0.012u	0.18u	29300	
	Pennwall																										
	Swan Island	8	28 Oct 88	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.225u	8000		
			8.1A	0.008u	0.008u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.009u	0.027u	0.14u		
			8.1B	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.011u	0.022u	0.16u			
			8.2A	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.02u	0.08u	0.8u		
	Ross Island	14	28 Oct 88	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.014u	2000		
	Sellwood Bridge	18	19 Aug 88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.045u	37800		
	Johnson Creek	18	28 Oct 88	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.15u	22000		
	Down Stream Oregon City	27	25 Oct 88	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.185u			
			10 Aug 88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.09u	6200		
	Up Stream Oregon City	28	25 Oct 88																						29000		
	Wilsonville	30	04 Oct 88	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.005u	0.16u			
			15 Aug 88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.0100		
	Newberg Pool	47	25 Oct 88	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.008u	0.018u	28000		
	Newberg	48	15 Aug 88	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.003u	0.039u	18800		

Summary: Sediment PAH Analyses

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River	Station	River Mile	Sample Date	Chemicals																									
				Leptanthes Depth (m)	Lycopene Depth (m)	Acenaphthylene Depth (m)	Acenaphthene Depth (m)	Dibenzanthracene Depth (m)	Fluorene Depth (m)	Dibenzanthracene Depth (m)	Acridine Depth (m)	Phenanthrene Depth (m)	Anthracene Depth (m)	Carcinol Depth (m)	Fluoranthene Depth (m)	Pyrene Depth (m)	Acenaphthene Depth (m)	Acenaphthylene Depth (m)	Chrysene Depth (m)	Benzothiophene Depth (m)	Phenanthrene Depth (m)	Pyrene (1,2,3-cd) Depth (m)	Benzothiophene Depth (m)	Dibenzothiophene Depth (m)	Benzothiophene Depth (m)				
Willamette River	St John's Bridge	8	10 Aug 88	100u	NA	200u	200u	NA	30u	NA	NA	10	4	NA	20	10u	NA	5	6	7	3	NA	6	6	10	9			
				30.2	0.26	0.11	14.0	11.4	3.16	3.16	3.16	27.6	0.3	0.03	17.4	15.6	0.94	2.95	2.8	2.06	1.22	1.15	0.34	0.44	0.18	0.41			
	SPAS Bridge	7	23 Aug 88	0.22	0.03u	0.03u	0.41	0.38	0.43	0.12	0.03u	1.38	0.12	0.03	0.88	0.69	0.55	0.55	0.18	0.12	0.54	0.07	0.03u	0.03u	0.03u	0.03u			
				0.25	0.03u	0.03u	0.03u	0.07	0.07	0.03u	0.03u	0.25	0.07	0.07	0.34	0.37	0.18	0.18	0.18	0.18	0.11	0.04	0.03u	0.03u	0.03u	0.03u			
	7 North	28 Oct 88	0.13u	NA	0.261u	0.034u	0.024u	0.261u	NA	NA	0.055u	0.021u	0.281u	0.134u	0.11u	0.045u	0.027u	0.015u	0.261u	NA	0.261u	0.261u	0.261u	0.066u					
	7 South	28 Oct 88	0.32u	NA	0.031u	0.071u	0.024u	0.064u	NA	NA	0.506	0.101u	0.3	0.08	0.708	0.02	0.23	0.315	0.168	NA	0.215u	0.127	0.3u	0.208					
	Down Lake	15 Aug 88	26u	NA	45u	NA	5.2u	5.3u	NA	NA	0.9	0.32	NA	2.8	2.3u	NA	1.1	1.2	1.0	0.51	NA	1.7	0.75u	1.5u					
	Pennwell	7	10 Aug 88	2000u	NA	4000u	4000u	NA	500u	NA	NA	800	200	NA	300	500	NA	200	300	300	100	NA	300	300	500	200			
				0	0.222u	NA	0.051u	0.161u	0.076u	0.104u	NA	NA	0.75u	0.11	0.465u	1.16	0.777	0.652	0.31u	0.487	0.476	0.78u	NA	0.389	0.273	0.187	0.441		
	Swan Island	0.1A	26 Oct 88																										
		0.1B	28 Jun 88																										
		0.2a																											
	Ross Island	14	26 Oct 88	0.0083u	NA	0.268u	0.288u	0.288u	0.268u	NA	NA	0.0072u	0.268u	0.268u	0.0082u	0.0051u	0.044u	0.268u	0.268u	0.268u	NA	0.268u	0.288u	0.268u	0.268u				
	Sekwood Bridge	16	15 Aug 88	0.52u	NA	0.89u	0.88u	NA	0.1u	NA	NA	0.19	0.03	NA	0.24	0.14	NA	0.05	0.03	0.15	0.02	NA	0.05	0.07	0.03u	0.16			
	Johnson Creek	16	28 Oct 88	0.0207u	NA	0.298u	0.298u	0.298u	0.298u	NA	NA	0.0256u	0.298u	0.298u	0.0558u	0.0672u	0.151u	0.0233u	0.043u	0.298u	0.298u	NA	0.298u	0.298u	0.298u	0.298u			
	Downtown Oregon City	27	25 Oct 88	0.0223u	NA	0.301u	0.381u	0.381u	0.381u	NA	NA	0.0412u	0.381u	0.381u	0.0854u	0.074u	0.26	0.0217u	0.035u	0.381u	0.381u	NA	0.341u	0.381u	0.381u	0.381u			
	Upstream Oregon City	28	10 Aug 88	1.6u	NA	3.7u	3.2u	NA	0.4	NA	NA	0.04	0.07	NA	0.08	0.18u	NA	0.03	0.03	0.08	0.03	NA	0.07	0.05u	0.1u	0.1u			
	Watsonia	30	04 Oct 88	0.0539u	NA	0.0094u	0.0053u	0.355u	0.355u	NA	NA	0.0494u	0.355u	NA	0.0581u	0.0488u	0.29u	0.355u	0.355u	0.355u	NA	0.355u	0.355u	0.355u	0.355u				
			15 Aug 88	0.41u	NA	-0.76u	0.78u	NA	0.09u	NA	NA	0.03	0.005	NA	0.04	0.04u	NA	0.008	0.006	0.003	NA	0.008	0.011	0.03u	0.023u				
	Newberg Pool	43	25 Oct 88	0.0125u	NA	0.0126u	0.355u	0.355u	0.355u	NA	NA	0.0372u	0.355u	0.355u	0.0281u	0.0481u	0.632u	0.355u	0.0166u	0.255u	0.355u	NA	0.355u	0.355u	0.355u	0.355u			
	Newberg	40	15 Aug 88	0.67u	NA	0.81u	0.81u	NA	0.89u	NA	NA	0.05	0.008	NA	0.01	0.04u	NA	0.007u	0.007u	0.1	0.002	NA	0.007	0.01u	0.03u	0.02u			
	Upstream Newberg Pool	52	26 Oct 88	0.511u	NA	0.511u	0.511u	0.511u	0.511u	NA	NA	0.511u	0.511u	0.511u	0.511u	0.0481u	0.035u	0.511u	0.511u	0.511u	NA	0.511u	0.511u	0.511u	0.511u				
	Wheatland Ferry	74	29 Aug 88	0.03u	NA	0.05u	0.05u	0.05u	0.05u	0.05u	NA	0.05u	0.05u	NA	0.05u	0.05u	NA	0.05u	0.05u	0.05u	0.05u	0.05u	0.05u	0.05u	0.05u	0.05u	0.05u		

APPENDIX A-11

SEDIMENT CHEMISTRY DATA

Reference

Technical Memorandum 5.4c — Assessment of CSO-Related Sediment Conditions in the Willamette River at Portland, Oregon, Limno-Tech, Inc. (for Portland Bureau of Environmental Services), 8/18/93.

ATTACHMENT 1

Summary of Trace Metal Concentrations in Portland Harbor Bottom Material, 1973-1984
(USGS Surveys)

Location	RM	Source	Date	Size Class	Copper	Lead	Zinc	Silver	Notes
	25.6	—	Aug-88	—	28	5.7	70.5	—	Spotcraft Marina Boat Ramp
	16.6	—	Aug-88	—	32.3	22.8	107	—	Staff Jennings Marina
	11.2	5	Jun-78	<2mm	30	60	110	—	
	11	1	Oct-83	<2mm	24	30	80	—	Composite
	10.4	6	Dec-82	<2mm	34	24	95	—	Berth 104, 105, 205 (Composite)
	10.25	6	Dec-82	<2mm	40	26	147	—	Slip 103, 203, 204 (Composite)
	9.95	1	Oct-83	<2mm	27	30	90	—	Composite
	9.8	8	Nov-84	<2mm	25	14	—	—	Berth 202
	9.8	8	Nov-84	<2mm	27	27	—	—	Berth 202
	9.8	7	Jul-84	<2mm	34	11	103	—	West Side of Channel
	9.8	7	Jul-84	<63µm	55	19	130	—	West Side of Channel
	9.8	7	Jul-84	<2mm	79	19	163	—	West Side of Channel
	9.7	8	Nov-84	<2mm	32	37	684	—	Slip 201
	9.7	8	Nov-84	<2mm	30	35	779	—	Slip 201
	9.7	8	Nov-84	<2mm	31	35	708	—	Slip 201
	9.7	—	Mar-87	—	26	24	107	0.5	Western Trans Dock-Sediment
	9.7	8	Nov-84	<2mm	29	25	436	—	Slip 201
	9.5	—	Mar-87	—	13	10	67	0.5	Western Trans Dock-Sediment
	9.4	—	Mar-87	—	21	19	70	0.5	Western Trans Dock-Sediment
	9.4	1	Oct-83	<2mm	30	25	110	—	Composite
	9.2	3	May-77	<2mm	35	20	20	—	—
	9.2	8	Nov-84	<2mm	31	40	87	—	—
	9.2	8	Nov-84	<2mm	31	35	85	—	—
	8.8	—	Jan-88	—	212	7.7	216	0.93	Swan Island Channel at Boat Ramp
	8.8	—	Jan-88	—	319	23.2	335	0.77	Swan Island Channel at Boat Ramp
	8.6	—	Jan-88	—	320	151	703	0.57	Swan Island Channel Opp Cenex Tower
	8.6	—	Jan-88	—	263	169	790	1.01	Swan Island Channel Opp Cenex Tower
	8.5	1	Oct-83	<2mm	28	20	85	—	Composite
	8.5	2	Sep-73	<2mm	15	10	185	—	—
	8.5	2	Sep-73	<2mm	15	30	225	—	—
	8.5	2	Sep-73	<2mm	10	20	205	—	—
	8.5	2	Sep-73	<2mm	15	20	180	—	—
	8.1	—	Jan-88	—	89.1	20.6	231	0.63	Swan Island Channel at Coast Guard Dock
	8.1	—	Jan-88	—	101	30.5	272	0.63	Swan Island Channel at Coast Guard Dock
	7.1	9	Aug-84	<2mm	26	3	147	—	Near Doane Lake
	7.1	7	Jul-84	<2mm	33	29	127	—	Near Doane Lake
	7.1	7	Jul-84	<63µm	48	32	150	—	Near Doane Lake
	7.1	7	Jul-84	<2mm	83	56	192	—	Near Doane Lake
	7	—	Aug-88	—	53.9	25.2	160	—	SPSRR Bridge
	7	—	Aug-88	—	31.1	33.9	121	—	SPSRR Bridge
	6.8	9	Aug-84	<2mm	54	3	126	—	East Side of Channel
	6	—	Feb-88	—	80	94	270	0.02	St. John Bridge
	6	—	Feb-88	—	88	96	275	0.02	St. John Bridge
	6	—	Aug-88	—	47.5	35.7	159	—	St. John Bridge
	6	2	Sep-73	<2mm	5	10	145	—	—
	4.7	6	Dec-82	<2mm	11	22	103	—	Slip 401, 414, 416
	4.5	6	Jul-83	<2mm	26	236	326	—	Slip 412
	4.5	6	Jul-83	<2mm	—	187	—	—	Slip 411
	4.5	6	Dec-82	<2mm	15	172	261	—	Slip 410, 411
	4.4	1	Oct-83	<2mm	35	30	120	—	Composite Near Terminal #4
	1.5	2	Sep-73	<2mm	10	20	195	—	—
	1.5	2	Sep-73	<2mm	15	10	215	—	—
	1.5	2	Sep-73	<2mm	10	20	210	—	—
	1.5	2	Sep-73	<2mm	15	10	215	—	—
	1	6	Jul-83	<2mm	26	8	115	—	Near Terminal #5

Units are in mg/Kg unless otherwise mentioned

SOURCES

- 1- USGS study, 1983
- 2- Rickert and Others, 1977
- 3- Rinella and McKenzie, 1977
- 4- McKenzie, 1977
- 5- Rinella, USGS, Written Communication, 1978
- 6- CH2M Hill, 1983
- 7- A. Hortwitz, USGS, Written Communication, 1984
- 8- B. Balaski, Port of Portland, Written Communication, 1984
- 9- B. Cleland, U.S. EPA, Written Communication, 1984

APPENDIX A-12

SEDIMENT CHEMISTRY DATA

Reference

Fuhrer, Gregory J. 1989. Quality of Bottom Material and Elutriates in the Lower Willamette River, Portland Harbor, Oregon. U.S. Geologic Survey, Water Resources Investigations Report 89-4005. Prepared in cooperation with the U.S. Army Corps of Engineers.

Table 5.--Selected trace-metal, nutrient, and carbon analyses of Portland Harbor bottom-material composites, October 1983

(Concentrations are given in micrograms per gram ($\mu\text{g/g}$) except where otherwise indicated. Metals in bottom material are reported as "total recoverable" when less than 95 percent of the trace metals are solubilized; otherwise they are reported as "total." "--" indicates analyses not made. < = less than. P = phosphorus. C = carbon, N = nitrogen, g/kg = gram per kilogram, mg/kg = milligram per kilogram)

Location of sample composites (river mile)	Barium, Cadmium, Chromium, Copper,								Iron, Manganese,			
	Antimony, Arsenic, recover-		recover-		recover-		Cyanide,		total	Lead, total	recover-	Mercury,
	total	total	able	able	able	able	total	percent	recover-	able	percent	recover-
4.3 + 4.5	<1	5	110	<1	10	35	<1	1.2	30	0.05	0.08	
8.3 + 8.7	<1	2	120	<1	10	28	<1	1.2	20	.05	.07	
(9.2 + 9.6)A ^{1/}	<1	6	110	<1	10	30	<1	1.2	20	.05	.12	
(9.2 + 9.6)B	<1	3	110	<1	10	30	<1	1.2	30	.05	.14	
9.8 + 10.1	<1	5	110	<1	10	27	<1	1.2	30	.04	.08	
10.7 + 11.3	<1	3	100	<1	10	24	<1	0.9	30	.04	.08	

Location of sample composites (river mile)	Nickel, Zinc, Ammonia +				Nitrogen,				Carbon, Chemical			
	total		total		Ammonia, organic, (mg/kg, as N)		Phosphorus, inorganic, + organic, (mg/kg, as N)		Carbon, total, (g/kg, as C)	inorganic total, (g/kg, as C)	oxygen demand, (g/kg, as C)	Oil and grease, (mg/kg)
	recover-	Selenium, recover-	able	total	able	as N)	(mg/kg as P)	total, as C)	(g/kg, as C)	(g/kg, as C)	(mg/kg)	(mg/kg)
4.3 + 4.5	30	<1	120	250	1,400	900	0.2	19	--	<1		
8.3 + 8.7	30	<1	85	260	1,300	790	.2	17	55,000	<1		
(9.2 + 9.6)A ^{1/}	30	<1	110	330	1,700	840	.4	23	69,000	1		
(9.2 + 9.6)B	30	<1	110	290	1,700	890	.5	22	76,000	<1		
9.8 + 10.1	40	<1	90	210	1,100	870	.2	16	69,000	<1		
10.7 + 11.3	20	<1	80	220	1,300	880	.2	17	43,000	2		

^{1/} Samples A and B are replicate samples of composited bottom materials from river miles 9.2 and 9.6.

Table 6.--Concentrations of organic compounds in Portland Harbor bottom material, October 1983

[Concentrations given in micrograms per kilogram ($\mu\text{g}/\text{kg}$); "u" = unable to determine because of interference; "--" analyses not made, "<" = less than, DDD = dichloro diphenyl dichloroethane, DDE = dichloro diphenyl dichloroethylene, DDT = dichloro diphenyl trichloroethane, 2,4-D = 2,4-dichloro phenoxy acetic acid, 2,4-DP = 2,4-dichloro phenoxy propanoic acid, 2,4,5-T = 2,4,5-trichloro phenoxy acetic acid]

Compounds	Concentrations at indicated location (river mile)									
	11.3	10.7	10.1	9.8	1/ 9.2A	9.2B	2/ 8.7A	8.7B	4.5	4.3
Organochlorine compounds:										
Aldrin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlordane	1	7	10	4	2	3	5	7	5	6
DDD	.7	4.5	6.2	2.5	4.3	5.4	4.5	5.6	8.8	14
DDE	.7	4.8	<.1	1.9	2.4	2.4	2.7	<.1	2.9	3.9
DDT	.2	.4	<.1	.7	<.1	<.1	<.1	<.1	.8	1.3
Dieldrin	.1	.2	.2	.4	<.1	.1	.2	.1	.2	.3
Endosulfan	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
Endrin	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
Gross polychlorinated biphenyls (PCB)	14	53	170	26	39	41	67	83	58	76
Gross polychlorinated napthalenes (PCN)	u	u	u	u	u	u	u	u	u	u
Heptachlor	<.1	.3	.4	.2	.2	.2	.3	.3	.3	.4
Heptachlor epoxide	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
Lindane	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1	<.1
Methoxychlor	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Mirex	--	<.1	--	<.1	<.1	--	<.1	--	--	<.1
Herbicide compounds:										
Silvex	--	<.1	--	<.1	<.1	--	<.1	--	--	<.1
2,4-D	--	<.1	--	<.1	<.1	--	<.1	--	--	<.1
2,4-DP	--	<.1	--	<.1	<.1	--	<.1	--	--	<.1
2,4,5-T	--	<.1	--	<.1	<.1	--	<.1	--	--	<.1
Halogenated aliphatics:										
bis(2-Chloroethoxy)methane	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hexachlorobutadiene	<10	<20	<10	<15	<20	<30	<20	<30	<30	<20
Hexachlorocyclopentadiene	<10	<25	<10	<20	<30	<40	<20	<30	<40	<20
Hexachloroethane	<10	<30	<20	<25	<30	<40	<30	<40	<40	<30
Ethers:										
4-Bromophenyl phenyl ether	<10	<25	<10	<40	<25	<30	<20	<20	<60	<30
bis(2-Chloroethyl)ether	<10	<10	<10	<10	<10	<20	<10	<10	<20	<10
bis(2-Chloroisopropyl)ether	<10	<10	<20	<10	<10	<10	<10	<10	<10	<10
4-Chlorophenyl phenyl ether	<10	<20	<10	<30	<20	<20	<20	<20	<50	<25
Phthalate esters:										
Butyl benzyl phthalate	<10	<30	<10	<25	<30	<20	<10	<20	<50	<30
Diethyl phthalate	<30	<40	<20	<50	<40	<30	<50	<50	<40	<50
Dimethyl phthalate	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Di-N-butyl phthalate	<30	<20	<20	<20	<25	<20	<30	<30	<20	<15
Di-N-octylphthalate	<10	<20	<10	<20	<20	<10	<10	<10	<30	<20
bis(2-Ethylhexyl)phthalate	90	<20	60	120	40	40	110	60	<50	<20
Pesticides:										
Isophorone	<20	<30	<20	<30	<35	<50	<30	<40	<50	<30
2,3,7,8-Tetrachlorodibenzo-p-dioxin	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200

Table 6.--Concentrations of organic compounds in Portland Harbor bottom material, October 1983--Continued

Compounds	Concentrations at indicated location (river mile)									
	11.3	10.7	10.1	9.8	1/ 9.2A	9.2B	2/ 8.7A	8.7B	4.5	4.3
Polycyclic aromatics:										
Acenaphthene	80	<10	<10	<20	<10	<20	<10	<20	100	50
Acenaphthylene	30	<10	<10	<10	<10	<10	<10	<10	<10	<10
Anthracene	80	<10	<20	<20	<20	<30	<20	<30	<20	<50
Benzo(a)anthracene	170	<20	<10	<20	<20	<20	<10	<20	<40	<20
Benzo(b)fluoranthene	100	<35	<10	<30	<30	<30	<10	<20	<60	<35
Benzo(k)fluoranthene	270	<35	<10	<30	<30	<30	<10	<20	<60	<35
Benzo(g,h,i)perylene	<200	<390	<100	<350	<350	<260	<100	<210	<680	<360
Benzo(a)pyrene	250	<45	<20	<40	<40	<30	<10	<30	<80	<40
Chrysene	260	<20	<10	<20	<20	<20	<10	<20	<40	<20
Dibenz(a,h)anthracene	<100	<150	<40	<140	<140	<100	<40	<80	<270	<140
Fluoranthene	310	<10	<10	13	9	<10	18	20	<40	20
Fluorene	150	<10	<10	<10	<10	<10	<10	<10	50	10
Indeno(1,2,3cd)pyrene	<100	<240	<60	<210	<220	<160	<70	<130	<420	<220
Naphthalene	180	20	10	14	30	40	18	20	50	50
Phenanthrene	760	<10	<20	<20	<20	<20	<20	<30	<80	<40
Pyrene	550	<20	20	28	22	30	11	30	70	45
Monocyclic aromatics:										
1,2-Dichlorobenzene	<10	<10	<10	<10	<10	<20	<10	<20	<20	<10
1,3-Dichlorobenzene	<10	<10	<10	<10	<10	<20	<10	<20	<20	<10
1,4-Dichlorobenzene	<10	<10	<10	<10	<10	<20	<10	<20	<20	<10
2,4-Dinitrotoluene	<10	<10	<10	<20	<10	<30	<10	<30	<60	<35
2,6-Dinitrotoluene	<20	<40	<20	<60	<40	<40	<30	<40	<100	<95
Hexachlorobenzene	<10	<20	<10	<25	<20	<20	<15	<20	<50	<20
Nitrobenzene	<10	<10	<10	<10	<10	<20	<10	<20	<20	<10
1,2,4-Trichlorobenzene	<10	<10	<10	<10	<10	<20	<10	<20	<20	<10
Compounds related to PCB:										
2-Chloronaphthalene	<10	<10	<10	<10	<10	<20	<10	<10	<10	<10
Nitrosamines and other:										
Benzidine	<10	<40	<10	<30	<40	<30	<10	<20	<70	<40
3,3-Dichlorobenzidine	<30	<85	<10	<75	<75	<60	<25	<50	<150	<80
N-Nitrosodiphenylamine	<10	<20	<10	<30	<20	<20	<20	<20	<40	<20
N-Nitrosodi-N-propylamine	<20	<30	<20	<30	<35	<50	<30	<40	<50	<30
Phenols and cresols:										
4-Chloro-3-methylphenol	<200	<10	<20	<10	<10	<40	<10	<20	<30	<10
2-Chlorophenol	<10	<40	<10	<10	<10	<20	<10	<20	<20	<10
2,4-Dichlorophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4-Dimethylphenol	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
4,6-Dinitro-2-methylphenol	<20	<40	<20	<60	<40	<50	<30	<40	<100	<50
2,4-Dinitrophenol	<30	<70	<20	<100	<70	<80	<60	<70	<170	<70
2-Nitrophenol	<10	<15	<10	<15	<15	<20	<15	<20	<20	<15
4-Nitrophenol	<300	<75	<20	<100	<70	<90	<60	<80	<100	<95
Pentachlorophenol	<30	<75	<20	<100	<70	<80	<60	<70	<180	<90
Phenol	<30	<50	<40	<30	<30	<40	<50	<40	<30	<30
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10	<20	<10	<20	<20	<10

1/ Samples from RM 9.2A and 9.2B are longitudinal splits from the same core that was also split for particle size analyses.

2/ Samples from RM 8.7A and 8.7B are longitudinal splits from the same core that was also split for particle size analyses.

Table 7.--Particle size, total-volatile solids, and moisture content of Portland Harbor bottom material, October 1983

[--- = analyses not made, pct = percent]

Sampling location (river mile)	Percent particle size finer than specified diameters (in micrometers)										Total volatile solids (pct)	Moisture (pct)		
	Sands					Silts				Clays				
	700	500	350	175	125	88	62	31	16	8	4	2		
11.3	100	97	80	18	16	15	13	10	7	5	4	3	2.8	36
10.7	100	100	100	98	93	82	66	47	32	22	14	10	7.0	54
10.1	100	100	100	93	88	80	69	49	32	22	15	10	6.7	47
9.8	100	100	100	100	95	74	60	41	29	24	12	11	7.0	49
9.6	100	100	100	100	100	98	93	62	39	25	17	13	8.8	54
9.2A ^{1/}	100	99	94	68	63	61	59	52	36	23	18	11	6.0	50
9.2B ^{2/}	100	100	99	74	62	54	48	42	30	19	15	9	--	--
9.2C ^{3/}	100	100	98	79	70	64	57	47	30	21	14	9	--	--
8.7A ^{3/}	100	100	100	98	92	82	73	51	36	23	20	13	6.5	53
8.7B	100	100	100	99	91	79	68	46	30	21	14	11	--	--
8.3	100	100	100	99	97	89	77	42	32	17	10	5	8.1	50
4.5	100	99	94	79	77	72	65	50	34	22	14	11	6.4	51
4.3	100	100	97	66	86	82	75	60	42	28	24	14	7.4	49

1/ Samples from river miles 9.2A and 9.2B are longitudinal splits from the same core that was also split for organic analyses.

2/ Sample from river mile 9.2C is a subsample from the cores that were processed in the elutriate test (table 5).

3/ Samples from river miles 8.7A and 8.7B are longitudinal splits from the same core that was also split for organic analyses.

Table 8.--Comparison of trace element concentrations in Portland Harbor bottom material, 1973-84, with trace-metal concentrations found in rocks, soils, and claystones and shales

[Concentrations are reported in $\mu\text{g/g}$ (micrograms per gram), --- = analyses not made. Modes are shown in parenthesis. Data sources are shown in brackets as the following: [1] = Wedepohl and others, 1970a; [2] = Wedepohl and others, 1970b; [3] = Rickert and others, 1973; [4] = Dave Dunnette, Oregon Department of Environmental Quality, oral commun., 1982]

Trace metal	Trace-metal concentrations											
	Portland Harbor bottom material				Claystones and shales							
	1/	2/	3/	4/	5/	6/	7/	8/	9/	10/	11/	12/
Trace metal	Slough	Slips	Berths	Main Channel	Rocks	Rocks	Rocks	Rocks	Rocks	Soils	Soils	Soils
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Cadmium	1.2	0.7	0.4	0.5	0.08-0.2	--	--	--	--	--	--	--
Lead	24	36	23	20	--	1.2-8.5	<10-15 (<10)	9-16	18	15	20	
Zinc	147	436	99	127	--	119	<25-159 (<25)	53-70	51	68	88	

1/ Median concentrations.

2/ Values represent concentration ranges and modes (parenthetical values) in 36 rock samples from throughout the Willamette River basin.

3/ Values represent concentration ranges from 80 stations throughout Oregon, 1979-81.

4/ Values represent average concentrations from 64 stations located in western Oregon, 1971-81.

5/ Lead values represent modal concentrations of 50 soils; zinc value represents average concentration of 3 soils

6/ Values represent worldwide averages.

APPENDIX A-13

SEDIMENT CHEMISTRY DATA

Reference

McKenzie, S.W., 1977, Analyses of bottom material from the Willamette River, Portland Harbor, Oregon: U.S. Geological Survey Open-File Report 77-740, 8p.

Table 5.--Chemical analyses of bottom material

[Mg/kg, milligrams per kilogram; ug/kg, micrograms per kilogram;
1b/yd³, pounds per cubic yard]

Parameter	Sample identification			
	A (mg/kg)	B (mg/kg)	A (1b/yd ³)	B (1b/yd ³)
Residue, loss on ignition	78,400	77,800	91	90
Chemical oxygen demand	70,000	76,000	81	88
Total organic carbon	23,000	23,000	27	27
Total phosphorus, as P	270	60	.31	.07
Kjeldahl nitrogen, as N	1,320	1,490	1.5	1.7
Nitrate plus nitrite nitrogen, as N	0	0	0	0
Nitrite nitrogen, as N	0	0	0	0
Nitrate nitrogen, as N	0	0	0	0
Ammonia nitrogen, as N	170	260	.20	.31
Arsenic	5	5	6×10^{-3}	6×10^{-3}
Cadmium	< 1	< 1	$< 1.2 \times 10^{-3}$	$< 1.2 \times 10^{-3}$
Total chromium	14	14	.02	.02
Cobalt	15	15	.02	.02
Copper	31	31	.04	.04
Cyanide	180	170	.21	.20
Iron	17,000	16,000	20	19
Lead	40	35	.05	.04
Manganese	460	520	.53	.60
Mercury	.11	.11	1.3×10^{-4}	1.3×10^{-4}
Nickel	15	15	.02	.02
Selenium	0	0	0	0
Zinc	87	85	.10	.099
Phenol	.25	.54	2.9×10^{-4}	6.2×10^{-4}

APPENDIX A-14

SEDIMENT CHEMISTRY DATA

Reference

Appendix B from:

Tetra Tech, Inc. 1992. Willamette River Basin Water Quality Study—Component 2: Review and Summary of Toxic Pollutants in the Willamette River and Major Tributaries. Prepared by Tetra Tech, Inc., Bellevue, Washington, for the Oregon Department of Environmental Quality. 27 August 1992.

Please note stations included in the study area are stations 21 through stations 25.

APPENDIX B-1. SEDIMENT METALS (MG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	AGENCY	LAT	LONG	LOCATION NAME	DATE	NUM PARM	AS	BA	CD
13	DEQ	451612.1	1225642.2	WILLAMETTE RIVER AT HWY 219 (NEW NEWBERG BR)	880815	7	19.7		0.5 U
14	DEQ	451326.2	1230402.6	YAMHILL RIVER AT DAYTON	880815	7	29.6		0.5 U
15	DEQ	451738.5	1224608.7	WILLAMETTE RIVER AT I-5 (WILSONVILLE)	880815	7	18		0.5 U
16	DEQ	452149.7	1223622.5	WILLAMETTE RIVER AT SPORTCRAFT MARINA/BOAT RAMP	880810	7	42.6		0.5 U
17	DEQ	452758	1223950.9	WILLAMETTE RIVER AT STAFF JENNINGS MARINA	880815	7	14.8		0.5 U
18	EPA	453309.5	1224232	WILLAMETTE R. WESTERN TRANS DOCK-SEDIMENTS	870324	11	0.05 U	40	1.1
19	EPA	453306	1224222	WILLAMETTE R. WESTERN TRANS DOCK-SEDIMENTS	870324	11	0.05 U	30	1
20	EPA	453301	1224214	WILLAMETTE R. WESTERN TRANS DOCK-SEDIMENTS	870324	11	0.05 U	80	1.5
21	DEQ	453411.3	1224317.8	SWAN ISLAND CHANNEL AT COAST GUARD DOCK	880126	12	3.9		0.5 U
21	DEQ	453411.3	1224317.8	SWAN ISLAND CHANNEL AT COAST GUARD DOCK	880126	12	4.6		0.5 U
22	DEQ	453404.3	1224304.4	SWAN ISLAND CHANNEL OPP CENEX TOWER	880126	12	14.5		0.5 U
22	DEQ	453404.3	1224304.4	SWAN ISLAND CHANNEL OPP CENEX TOWER	880126	12	15.3		0.5 U
23	DEQ	453403.5	1224255.6	SWAN ISLAND CHANNEL AT BOAT RAMP	880126	12	5		0.5 U
23	DEQ	453403.5	1224255.6	SWAN ISLAND CHANNEL AT BOAT RAMP	880126	12	7.7		0.5 U
24	DEQ	453445.5	1224441.9	WILLAMETTE RIVER AT SP&S RR BRIDGE (PORTLAND)	880810	7	54		0.5 U
24	DEQ	453445.5	1224441.9	WILLAMETTE RIVER AT SP&S RR BRIDGE (PORTLAND)	880815	7	18.6		0.5 U
25	DEQ	453505	1224550	WILLAMETTE RIVER AT ST JOHNS BRIDGE	880201	12	2.5		1.8
25	DEQ	453505	1224550	WILLAMETTE RIVER AT ST JOHNS BRIDGE	880201	12	2.5		1.2
25	DEQ	453505	1224550	WILLAMETTE RIVER AT ST JOHNS BRIDGE	880810	7	45.5		0.9

Remark codes:

U = Material was analyzed for but not detected

APPENDIX B-1. SEDIMENT METALS (MG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	CR	CU	PB	NI	AG	ZN	SB	SE	TH	HG
13	880815	17.6	20.6	11.1			62.5				0.008 U
14	880815	27.2	39.4	17.1			87				0.008 U
15	880815	20.6	23.4	13.6			72.6				0.008 U
16	880810	26	28	5.7			70.5				0.008 U
17	880815	25.3	32.3	22.8			107				0.03
18	870324	10	21	19	14	0.5 U	70		0.05 U		0.05 U
19	870324	8	13	10	13	0.5 U	67		0.05 U		0.05 U
20	870324	14	26	24	14	0.5 U	107		0.05 U		0.05 U
21	880126	31.1	89.1	20.6	26.1	0.63	231	0.1 U	0.1 U	0.2 U	0.1
21	880126	38.8	101	30.5	30.1	0.63	272	0.1 U	0.1 U	0.2 U	0.1
22	880126	90.8	320	151	40.9	0.57	703	0.1 U	0.1 U	0.2 U	1.7
22	880126	81	263	169	41.2	1.01	790	0.1 U	0.1 U	0.2 U	0.1
23	880126	39.4	212	7.7	30.5	0.93	216	0.1 U	0.1 U	0.2 U	0.04
23	880126	43.7	319	23.2	35.5	0.77	335	0.1 U	0.1 U	0.2 U	0.04
24	880810	32.9	53.9	25.2			160				0.1
24	880815	20.4	31.1	33.9			121				0.03
25	880201	16.5	80	94	24.9	0.02 U	270	0.2	0.5 U	0.1 U	0.04
25	880201	27	88	96	26.1	0.02 U	275	0.1 U	0.5 U	0.1 U	0.07
25	880810	43.2	47.5	35.7			159				0.03

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APPENDIX B-2. SEDIMENT PESTICIDES/PCBS (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	AGENCY	LOCATION NAME	LAT	LONG	DATE	NUM PARM	ENDO SULFAN SULFATE	ENDO SULFAN BETA	ENDO SULFAN ALPHA
1	USGS	AMAZON CREEK AT AMAZON PARK	440136	1230442	900913	14			
2	USGS	AMAZON CREEK AT 16TH & CHAMBERS	440233	1230657	900912	14			
3	USGS	AMAZON CREEK AT 14TH & MADISON	440237	1230559	900913	14			
4	USGS	AMAZON CREEK AT BAILEY HILL RD.	440247	1230849	900912	14			
5	USGS	AMAZON CREEK AT CITY VIEW ABOVE OAK PATCH	440246	1230734	900912	14			
6	USGS	AMAZON CREEK AT BERTLESON AND STEWART	440300	1230940	900911	14			
7	USGS	A-3 AT 5TH & WALLIS ABOVE BERTLESON SLOUGH	440314	1230911	900911	14			
8	USGS	A3 AT MID BERTLESON SLOUGH	440322	1230932	900912	14			
9	USGS	A-3 AT BERTLESON SLOUGH OUTFALL	440322	1230940	900911	14			
10	USGS	AMAZON CREEK BELOW ARROWSMITH	440329	1231120	900910	15			
11	USGS	A-3 AT ROOSEVELT AND TERRY	440347	1231113	900911	15			
12	USGS	AMAZON CREEK AT 29TH & HILYARD	440347	1231146	900913	14			
13	DEQ	WILLAMETTE RIVER AT HWY 219 (NEW NEWBERG BR)	451612.1	1225642.2	880815	25	3 U	3 U	3 U
14	DEQ	YAMHILL RIVER AT DAYTON	451326.2	1230402.6	880815	25	2 U	2 U	2 U
15	DEQ	WILLAMETTE RIVER AT I-5 (WILSONVILLE)	451738.5	1224608.7	880815	25	3 U	3 U	3 U
16	DEQ	WILLAMETTE RIVER AT SPORTCRAFT MARINA/BOAT RAMP	452149.7	1223622.5	880810	26	3 U	3 U	3 U
17	DEQ	WILLAMETTE RIVER AT STAFF JENNINGS MARINA	452758	1223950.9	880815	25	3 U	3 U	3 U
18	EPA	WILLAMETTE R. WESTERN TRANS DOCK-SEDIMENTS	453309.5	1224232	870324	1			
19	EPA	WILLAMETTE R. WESTERN TRANS DOCK-SEDIMENTS	453306	1224222	870324	1			
20	EPA	WILLAMETTE R. WESTERN TRANS DOCK-SEDIMENTS	453301	1224214	870324	1			
21	DEQ	SWAN ISLAND CHANNEL AT COAST GUARD DOCK	453411.3	1224317.8	880126	26	18 U	18 U	18 U
21	DEQ	SWAN ISLAND CHANNEL AT COAST GUARD DOCK	453411.3	1224317.8	880126	26	16 U	16 U	16 U
22	DEQ	SWAN ISLAND CHANNEL OPP CENEX TOWER	453404.3	1224304.4	880126	26	40 U	40 U	40 U
22	DEQ	SWAN ISLAND CHANNEL OPP CENEX TOWER	453404.3	1224304.4	880126	26	75 U	75 U	75 U
23	DEQ	SWAN ISLAND CHANNEL AT BOAT RAMP	453403.5	1224255.6	880126	26	22 U	22 U	22 U
23	DEQ	SWAN ISLAND CHANNEL AT BOAT RAMP	453403.5	1224255.6	880126	26	22 U	22 U	22 U
24	DEQ	WILLAMETTE RIVER AT SP&S RR BRIDGE (PORTLAND)	453445.5	1224441.9	880810	26	6 U	6 U	6 U
24	DEQ	WILLAMETTE RIVER AT SP&S RR BRIDGE (PORTLAND)	453445.5	1224441.9	880815	25	3 U	3 U	3 U
25	DEQ	WILLAMETTE RIVER AT ST JOHNS BRIDGE	453505	1224550	880201	26	18 U	18 U	18 U
25	DEQ	WILLAMETTE RIVER AT ST JOHNS BRIDGE	453505	1224550	880201	26	20 U	20 U	20 U
25	DEQ	WILLAMETTE RIVER AT ST JOHNS BRIDGE	453505	1224550	880810	26	6 U	6 U	6 U

Remark codes:

U - Material was analyzed for but not detected

APPENDIX B-2. SEDIMENT PESTICIDES/PCBS (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	ENDRIN ALDEHY	ALPHA BHC	BETA BHC	DELTA BHC	PCNS	PP DDT	PP DDD	PP DDE	ALDRIN	BHC GAMMA	CHLOR DANE	DDD	DDE
1	900913					1	K			0.1	K	0.1	K	
2	900912					1	K			1	K	0.1	K	14
3	900913					1	K			0.1	K	0.1	K	9
4	900912					1	K			0.1	K	0.1	K	4.1
5	900912					1	K			0.1	K	0.1	K	9.2
6	900911					1	K			0.1	K	0.1	K	9.7
7	900911					1	K			0.1	K	1	K	25
8	900912					1	K			1	K	0.1	K	120
9	900911					1	K			0.1	K	1	K	75
10	900910					1	K			0.1	K	0.1	K	3.5
11	900911					1	K			0.1	K	0.1	K	4.6
12	900913					1	K			0.1	K	0.1	K	6.4
13	880815	3	U	3	U	3	U	3	U	3	U	3	U	3
14	880815	2	U	2	U	2	U	2	U	2	U	2	U	2
15	880815	3	U	3	U	3	U	3	U	3	U	3	U	3
16	880810	3	U	3	U	3	U	3	U	3	U	3	U	6
17	880815	3	U	3	U	3	U	3	U	3	U	3	U	3
18	870324													
19	870324													
20	870324													
21	880126	18	U	9	U	9	U	9	U	18	U	18	U	27
21	880126	16	U	11	U	11	U	11	U	16	U	18	N	22
22	880126	40	U	20	U	20	U	20	U	40	U	40	U	80
22	880126	75	U	25	U	25	U	25	U	75	U	75	U	100
23	880126	22	U	15	U	15	U	15	U	22	U	22	N	30
23	880126	22	U	7.5	U	7.5	U	7.5	U	7.5	U	7.5	N	30
24	880810	6	U	6	U	6	U	6	U	21	1400	270	6	U
24	880815	3	U	3	U	3	U	3	U	160	490	84	3	U
25	880201	18	U	9	U	9	U	9	U	9	U	9	U	18
25	880201	20	U	15	U	15	U	15	U	10	U	10	U	20
25	880810	6	U	6	U	6	U	6	U	6	U	6	U	12

APPENDIX B-2. SEDIMENT PESTICIDES/PCBS (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	DDT	DIELDRIN	ENDO SULFAN	ENDRIN	TOXA PHENE	HEPTA CHLOR	HEPTA CHLOR EPOXIDE	METHOXY CHLOR	PCB 1221	PCB 1232	PCB 1242	PCB 1248
1	900913	0.1	K	8.8	0.1	K	0.1	K	10	K	0.1	K	1.8
2	900912	2		7	0.1	K	0.1	K	10	K	1	K	1.6
3	900913	.3		7.1	0.1	K	0.1	K	10	K	1	K	1.4
4	900912	10	K	2.7	1	K	0.1	K	10	K	0.1	K	0.1
5	900912	0.1	K	3.7	0.1	K	0.1	K	10	K	0.1	K	0.8
6	900911	10	K	10	0.1	K	0.1	K	10	K	0.1	K	0.1
7	900911	10	K	1.2	1	K	0.1	K	10	K	0.1	K	1
8	900912	0.1	K	1.6	0.1	K	0.1	K	10	K	1	K	0.1
9	900911	20	K	0.8	1	K	0.1	K	10	K	0.1	K	1
10	900910	0.1	K	2.2	0.1	K	0.1	K	10	K	0.1	K	0.1
11	900911	1	K	1	0.1	K	0.1	K	10	K	0.1	K	0.1
12	900913	0.1	K	8	0.1	K	0.1	K	10	K	0.1	K	1
13	880815			3	U	39	U	3	U	3	U	13	U
14	880815			2	U	36	U	2	U	2	U	12	U
15	880815			3	U	39	U	3	U	3	U	13	U
16	880810			3	U	90	U	3	U	3	U	30	U
17	880815			3	U	45	U	3	U	3	U	15	U
18	870324												
19	870324												
20	870324												
21	880126			18	U	140	U	9	U	9	U	50	U
21	880126			16	U	16	U	16	U	16	U	50	U
22	880126			40	U	40	U	20	U	20	U	200	U
22	880126			75	U	75	U	50	U	50	U	250	U
23	880126			22	U	22	U	15	U	15	U	100	U
23	880126			22	U	175	U	7.5	U	22	U	75	U
24	880810			6	U	6	U	6	U	6	U	60	U
24	880815			3	U	3	U	3	U	3	U	12	U
25	880201			18	U	18	U	9	U	18	U	90	U
25	880201			20	U	20	U	10	U	20	U	100	U
25	880810			6	U	6	U	6	U	6	U	60	U

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APPENDIX B-2. SEDIMENT PESTICIDES/PCBS (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	PCB 1254	PCB 1260	PCB 1016	PCBS	MIREX
1	900913					0.1 K
2	900912					1 K
3	900913					1 K
4	900912					0.1 K
5	900912					0.1 K
6	900911					0.1 K
7	900911					0.1 K
8	900912					0.1 K
9	900911					0.1 K
10	900910				20	0.1 K
11	900911					1 K
12	900913					0.1 K
13	880815	13 U	13 U	13 U		
14	880815	12 U	12 U	12 U		
15	880815	13 U	13 U	13 U		
16	880810	30 U	30 U	30 U		
17	880815	15 U	15 U	15 U		
18	870324				1000 U	
19	870324				1000 U	
20	870324				1000 U	
21	880126	50 U	160	50 U		
21	880126	50 U	260	50 U		
22	880126	4200	200 U	200 U		
22	880126	3100	250 U	250 U		
23	880126	75 U	45 N	75 U		
23	880126	60 U	66 N	60 U		
24	880810	60 U	50	60 U		
24	880815	15 U	15 U	15 U		
25	880201	90 U	90 U	90 U		
25	880201	100 U	100 N	100 U		
25	880810	60 U	350	60 U		

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APPENDIX B-3. SEDIMENT SEMIVOLATILES (JG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	AGENCY	LOCATION NAME	LAT	LONG	DATE	COUNT	PENTA CHLORO PHENOL	ACENAP THYLENE	ACENAP THENE	ANTHRA CENE
1	USGS	AMAZON CREEK AT AMAZON PARK	440136	1230442	900913	49	600 K	200 K	200 K	200 K
2	USGS	AMAZON CREEK AT 16TH & CHAMBERS	440233	1230657	900912	49	600 K	200 K	200 K	200 K
3	USGS	AMAZON CREEK AT 14TH & MADISON	440237	1230559	900913	49	600 K	200 K	200 K	200 K
4	USGS	AMAZON CREEK AT BAILEY HILL RD.	440247	1230849	900912	49	600 K	200 K	200 K	200 K
5	USGS	AMAZON CREEK AT CITY VIEW ABOVE OAK PATCH	440246	1230734	900912	49	600 K	200 K	200 K	5 K
6	USGS	AMAZON CREEK AT BERTLESON AND STEWART	440300	1230940	900911	49	600 K	5 K	200 K	10 K
7	USGS	A-3 AT 5TH & WALLIS ABOVE BERTLESON SLOUGH	440314	1230911	900911	49	770	30 K	20 K	20 K
8	USGS	A3 AT MID BERTLESON SLOUGH	440322	1230932	900912	49	660	10 K	200 K	20 K
9	USGS	A-3 AT BERTLESON SLOUGH OUTFALL	440322	1230940	900911	49	270	10 K	200 K	10 K
10	USGS	AMAZON CREEK BELOW ARROWSMITH	440329	1231120	900910	49	600 K	200 K	200 K	5 K
11	USGS	A-3 AT ROOSEVELT AND TERRY	440347	1231113	900911	49	540 K	50 K	200 K	40 K
12	USGS	AMAZON CREEK AT 29TH & HILYARD	440347	1231146	900913	49	600 K	200 K	200 K	200 K
13	DEQ	WILLAMETTE RIVER AT HWY 219 (NEW NEWBERG BR)	451612.1	1225642.2	880815	16		810 U	810 U	6
14	DEQ	YAMHILL RIVER AT DAYTON	451326.2	1230402.6	880815	16		690 U	690 U	1 J
15	DEQ	WILLAMETTE RIVER AT I-5 (WILSONVILLE)	451738.5	1224608.7	880815	16		760 U	760 U	5
16	DEQ	WILLAMETTE RIVER AT SPORTCRAFT MARINA/BOAT RAMP	452149.7	1223622.5	880810	16		3200 U	3200 U	20
17	DEQ	WILLAMETTE RIVER AT STAFF JENNINGS MARINA	452758	1223950.9	880815	16		890 U	890 U	30
18	EPA	WILLAMETTE R. WESTERN TRANS DOCK-SEDIMENTS	453309.5	1224232	870324	1				
19	EPA	WILLAMETTE R. WESTERN TRANS DOCK-SEDIMENTS	453306	1224222	870324	1				
20	EPA	WILLAMETTE R. WESTERN TRANS DOCK-SEDIMENTS	453301	1224214	870324	1				
21	DEQ	SWAN ISLAND CHANNEL AT COAST GUARD DOCK	453411.3	1224317.8	880126	85	4400 U	24 J	33 U	910 U
21	DEQ	SWAN ISLAND CHANNEL AT COAST GUARD DOCK	453411.3	1224317.8	880126	85	5100 U	47 U	82 U	150 J
22	DEQ	SWAN ISLAND CHANNEL OPP CENEX TOWER	453404.3	1224304.4	880126	85	5400 U	1100 U	130 J	240 J
22	DEQ	SWAN ISLAND CHANNEL OPP CENEX TOWER	453404.3	1224304.4	880126	85	6500 U	73 J	100 J	140 J
23	DEQ	SWAN ISLAND CHANNEL AT BOAT RAMP	453403.5	1224255.6	880126	85	6900 U	100 J	67 U	85 J
23	DEQ	SWAN ISLAND CHANNEL AT BOAT RAMP	453403.5	1224255.6	880126	85	6900 U	110 J	120 J	240 J
24	DEQ	WILLAMETTE RIVER AT SP&S RR BRIDGE (PORTLAND)	453445.5	1224441.9	880810	16		4000000 U	4000000 U	200000
24	DEQ	WILLAMETTE RIVER AT SP&S RR BRIDGE (PORTLAND)	453445.5	1224441.9	880815	16		45000 U	45000 U	320
25	DEQ	WILLAMETTE RIVER AT ST JOHNS BRIDGE	453505	1224550	880201	82	22000 U	4600 U	4600 U	4600 U
25	DEQ	WILLAMETTE RIVER AT ST JOHNS BRIDGE	453505	1224550	880201	82	34000	5300 U	230 J	78 J
25	DEQ	WILLAMETTE RIVER AT ST JOHNS BRIDGE	453505	1224550	880810	16		200000 U	200000 U	4000

Remark codes:

U = Material was analyzed for but not detected

K = Actual value is known to be less than the value given

J = Estimated value; value not accurate

APPENDIX B-3. SEDIMENT SEMIVOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	BENZO(B) FLUORAN THENE	BENZENE	BENZO(K) FLUORAN THENE	BENZO(A) PYRENE	BIS(2-CHLOR) ETHYL ETHER	BIS(2-CHLOR) ETHOXY METHANE	BIS(2 CHLOR) ISOPROP ETHER	N BUTYL BENZYL PHTHAL	CHRYSENE	
1	900913	400	K		400	K	200	K	200	K	
2	900912	400	K		400	K	200	K	200	K	
3	900913	400	K		400	K	200	K	200	K	
4	900912	70	K		70	K	200	K	200	K	
5	900912	60	K		70	K	200	K	200	K	
6	900911	40	K		40	K	200	K	200	K	
7	900911	80	K		150	K	110	K	200	K	
8	900912	60	K		90	K	110	K	200	K	
9	900911	50	K		50	K	40	K	200	K	
10	900910	40	K		40	K	30	K	200	K	
11	900911	80	K		90	K	110	K	200	K	
12	900913	400	K		400	K	400	K	200	K	
13	880815	100			3	J			200	K	
14	880815	90			4					J	
15	880815	60			3					J	
16	880810	80			30					J	
17	880815	150			20					J	
18	870324									30	
19	870324									30	
20	870324									30	
21	880126	200	J	9	11	J	170	J	910	U	
21	880126	1000	U	9	U	410	J	390	J	1000	U
22	880126	610	J	12	U	570	J	420	J	1100	U
22	880126	280	J	15	U	300	J	390	J	1300	U
23	880126	130	J	14	U	170	J	220	J	1400	U
23	880126	260	J	15	U	280	J	380	J	1400	U
24	880810	300000			100000		300000				
24	880815	1600			510		1700				
25	880201	300	J	4	U	280	J	320	J	4600	U
25	880201	1000	J	8	U	620	J	530	J	5300	U
25	880810	7000			3000		6000				

APPENDIX B-3. SEDIMENT SEMIVOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	DIETHYL PHTHAL	DIMETH PHTHAL	FLUORAN THENE	FLUORENE	HEXCHLOR CYCLOPENT DIENE	HEXA CHLORO ETHANE	INDENO 1,2,3-CD PYRENE	ISO PHORONE	N-NITROSO DI-N-PROP AMINE	N-NITROSO DIPHENYL AMINE		
1	900913	200	K	200	K	860	200	K	200	K	400	K	
2	900912	390		200	K	270	200	K	200	K	400	K	
3	900913	200	K	200	K	460	200	K	200	K	400	K	
4	900912	200	K	200	K	60	K	200	K	200	K	400	K
5	900912	200	K	200	K	100	K	200	K	200	K	10	K
6	900911	200	K	200	K	40	K	200	K	200	K	400	K
7	900911	200	K	200	K	220	30	K	200	K	80	K	
8	900912	200	K	200	K	120	K	30	K	200	K	400	K
9	900911	200	K	200	K	200	K	10	K	200	K	400	K
10	900910	200	K	200	K	40	K	200	K	200	K	400	K
11	900911	200	K	200	K	460	10	K	200	K	20	K	
12	900913	200	K	200	K	1200	200	K	200	K	400	K	
13	880815					40	90	U			10	U	
14	880815					20	80	U			10	U	
15	880815					40	90	U			10	J	
16	880810					60	400	U			50	U	
17	880815					240	100	U			70		
18	870324												
19	870324												
20	870324												
21	880126	910	U	910	U	480	J	49	J	1800	U	910	U
21	880126	1000	U	1000	U	790	J	87	J	2100	U	1000	U
22	880126	1100	U	1100	U	1400		140	J	2200	U	1100	U
22	880126	1300	U	1300	U	1200	J	93	J	2700	U	1300	U
23	880126	1400	U	1400	U	620	J	75	J	2800	U	1400	U
23	880126	1400	U	1400	U	1400	J	160	J	2800	U	170	J
24	880810					900000	500000	U			300000		
24	880815					2600	5300	U			750	U	
25	880201	4600	U	4600	U	300	J	4600	U	4600	U	4600	U
25	880201	5300	U	5300	U	1800	J	300	J	5300	U	5300	U
25	880810					20000	30000	U			6000		

APPENDIX B-3. SEDIMENT SEMIVOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	N-NITROSO DIMETHYL AMINE	NAPHTHA LENE	NITRO BENZENE	PARACHLORO META CRESOL	PHENAN THRENE	PYRENE	BENZO GHI PERYLENE	BENZO(A) ANTHRA CENE	1,2,5,6-DI BENZ(A) ANTHRACENE	2-CHLORO NAPHTHA LENE								
1	900913	200	K	80	K	200	K	600	K	340	780	400	K	400	K	200			
2	900912	200	K	100	K	200	K	600	K	200	260	400	K	400	K	200			
3	900913	200	K	140	K	200	K	600	K	390	460	400	K	400	K	200			
4	900912	200	K	20	K	200	K	600	K	40	70	400	K	20	K	200			
5	900912	200	K	10	K	200	K	600	K	50	90	10	K	20	K	200			
6	900911	200	K	10	K	200	K	600	K	30	40	400	K	20	K	200			
7	900911	200	K	150	K	200	K	600	K	180	200	400	K	80	K	400	K	200	
8	900912	200	K	70	K	200	K	600	K	100	180	400	K	30	K	400	K	200	
9	900911	200	K	70	K	200	K	600	K	70	110	400	K	40	K	30	K	200	
10	900910	200	K	10	K	200	K	600	K	20	40	400	K	10	K	400	K	200	
11	900911	200	K	60	K	200	K	600	K	190	690	50	K	90	K	400	K	200	
12	900913	200	K	90	K	200	K	600	K	510	940	400	K	270	K	400	K	200	
13	880815			470	U					50	40	30	U	7	U	30	U		
14	880815			400	U					10	40	20	U	7	U	20	U		
15	880815			440	U					30	40	30	U	8	U	30	U		
16	880810			1900	U					40	160	100	U	30	U	100	U		
17	880815			520	U					190	140	160	U	50	U	30	U		
18	870324																		
19	870324																		
20	870324																		
21	880126			9	U	910	U	910	U	280	J	580	J	180	J	170	J	910	U
21	880126			18	U	1000	U	1000	U	550	J	1400	J	600	J	340	J	390	J
22	880126			300	J	1100	U	1100	U	1000	J	1500	J	230	J	390	J	1100	U
22	880126			15	U	1300	U	1300	U	810	J	1600	J	280	J	450	J	1300	U
23	880126			14	U	1400	U	1400	U	580	J	780	J	120	J	260	J	1400	U
23	880126			15	U	1400	U	1400	U	1200	J	1500	J	250	J	490	J	1400	U
24	880810			2000000	U					800000	500000	200000		200000		500000			
24	880815			26000	U					900	2300	1500	U	1100	U	1500	U		
25	880201			4	U	4600	U	4600	U	160	J	450	J	4600	U	4600	U	4600	
25	880201			0.9	J	5300	U	5300	U	2800	J	1700	J	1000	J	930	J	5300	U
25	880810			100000	U					10000	10000	9000	U	5000		10000			

APPENDIX B-3. SEDIMENT SEMIVOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	2-CHLORO PHENOL	2-NITRO PHENOL	DI-N-OCTYL PHTHAL	2,4-DI CHLORO PHENOL	2,4 DI METHYL PHENOL	2,4-DI NITRO TOLUENE	2,4-DI NITRO PHENOL	2,4,6-TRI CHLORO PHENOL	2,6-DI NITRO TOLUENE	3,3-DI CHLORO BENZID
1	900913	200	K	200	K	400	K	200	K	200	K
2	900912	200	K	200	K	400	K	200	K	600	K
3	900913	200	K	200	K	400	K	200	K	600	K
4	900912	200	K	200	K	400	K	200	K	600	K
5	900912	200	K	200	K	400	K	200	K	600	K
6	900911	200	K	200	K	120	K	200	K	600	K
7	900911	200	K	200	K	400	K	200	K	600	K
8	900912	200	K	200	K	500	K	200	K	600	K
9	900911	200	K	200	K	340	K	200	K	600	K
10	900910	200	K	200	K	400	K	200	K	600	K
11	900911	200	K	200	K	400	K	200	K	600	K
12	900913	200	K	200	K	400	K	200	K	600	K
13	880815										
14	880815										
15	880815										
16	880810										
17	880815										
18	870324										
19	870324										
20	870324										
21	880126	910	U	910	U	150	U	910	U	4400	U
21	880126	1000	U	1000	U	1000	U	1000	U	5100	U
22	880126	1100	U	1100	U	1100	U	1100	U	5400	U
22	880126	1300	U	1300	U	1300	U	1300	U	6500	U
23	880126	1400	U	1400	U	1400	U	1400	U	6900	U
23	880126	1400	U	1400	U	1400	U	1400	U	6900	U
24	880810										
24	880815										
25	880201	4600	U	4600	U	130	U	4600	U	22000	U
25	880201	5300	U	5300	U	5300	U	5300	U	26000	U
25	880810										

APPENDIX B-3. SEDIMENT SEMIVOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	4-BROMO PHENYL PHEN ETH	4-CHLORO PHENYL PHEN ETH	4-NITRO PHENOL	4,6-DI NITRO-O CRESOL	PHENOL	BIS-2 ETHYL HEX PHTHAL	DI-N BUTYL PHTHAL	HEXACHLOR BENZENE	HEXACHLOR BUTA DIENE	2,4,5-TRI CHLORO PHENOL	
1	900913	200	K		600	K	200	K	41000	200	K	200
2	900912	200	K		600	K	210		14000	200	K	200
3	900913	200	K		600	K	200	K	22000	200	K	200
4	900912	200	K		600	K	200	K	1500	200	K	200
5	900912	200	K		600	K	530		3800	200	K	200
6	900911	200	K		600	K	200	K	1300	200	K	200
7	900911	200	K		600	K	30	K	6400	200	K	200
8	900912	200	K		600	K	200	K	1600	200	K	200
9	900911	200	K		600	K	60	K	1900	200	K	200
10	900910	200	K		600	K	200	K	1400	200	K	200
11	900911	200	K		600	K	200	K	1300	200	K	200
12	900913	200	K		600	K	200	K	25000	200	K	200
13	880815											
14	880815											
15	880815											
16	880810											
17	880815											
18	870324											
19	870324											
20	870324											
21	880126	910	U	910	U	4400	U	4400	U	910	U	9
21	880126	1000	U	1000	U	5100	U	5100	U	1000	U	18
22	880126	1100	U	1100	U	5400	U	5400	U	1100	U	820
22	880126	1300	U	1300	U	6500	U	6500	U	1300	U	15
23	880126	1400	U	1400	U	6900	U	6900	U	1400	U	14
23	880126	1400	U	1400	U	6900	U	6900	U	1400	U	6900
24	880810											
24	880815											
25	880201	4600	U	4600	U	22000	U	22000	U	4600	U	4
25	880201	5300	U	5300	U	26000	U	26000	U	5300	U	510
25	880810											

APPENDIX B-3. SEDIMENT SEMIVOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	3 NITRO ANILINE	4-NITRO ANILINE	O-CRESOL	1,2-DI BROMO ETHANE	METHYL ETHYL KETONE	METHYL ISOBUT KETONE	STYRENE	BENZYL ALCOHOL	BENZOIC ACID	DIBENZO FURAN
1	900913										
2	900912										
3	900913										
4	900912										
5	900912										
6	900911										
7	900911										
8	900912										
9	900911										
10	900910										
11	900911										
12	900913										
13	880815										
14	880815										
15	880815										
16	880810										
17	880815										
18	870324										
19	870324										
20	870324										
21	880126	4400	U	4400	U	910	U	9	U	7	U
21	880126	5100	U	5100	U	1000	U	9	U	9	U
22	880126	5400	U	5400	U	1100	U	12	U	11	U
22	880126	6500	U	6500	U	1300	U	15	U	6	U
23	880126	6900	U	6900	U	1400	U	14	U	6	U
23	880126	6900	U	6900	U	1400	U	15	U	6	U
24	880810										
24	880815										
25	880201	22000	U	22000	U	4600	U	4	U	4	U
25	880201	26000	U	26000	U	5300	U	8	U	16	U

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APPENDIX B-3. SEDIMENT SEMIVOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	1-METHYL NAPHTHAL	RETENE	OIL/GREASE	CARBAZOLE
1	900913				
2	900912				
3	900913				
4	900912				
5	900912				
6	900911				
7	900911				
8	900912				
9	900911				
10	900910				
11	900911				
12	900913				
13	880815				
14	880815				
15	880815				
16	880810				
17	880815				
18	870324			30	
19	870324			60	
20	870324			208	
21	880126	910	U	910	U
21	880126	1000	U	1000	U
22	880126	1100	U	1100	U
22	880126	1300	U	1300	U
23	880126	1400	U	1400	U
23	880126	1400	U	1400	U
24	880810				
24	880815				
25	880201				
25	880201				
25	880810				

APPENDIX B-4. SEDIMENT VOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	AGENCY	LAT	LONG	LOCATION NAME	DATE	NUM PARM	CARBON TETRA CHLORIDE	CHLORO BENZENE	CHLORO DIBROMO METH			
1	USGS	440136	1230442	AMAZON CREEK AT AMAZON PARK	900913	4						
2	USGS	440233	1230657	AMAZON CREEK AT 16TH & CHAMBERS	900912	4						
3	USGS	440237	1230559	AMAZON CREEK AT 14TH & MADISON	900913	4						
4	USGS	440247	1230849	AMAZON CREEK AT BAILEY HILL RD.	900912	4						
5	USGS	440246	1230734	AMAZON CREEK AT CITY VIEW ABOVE OAK PATCH	900912	4						
6	USGS	440300	1230940	AMAZON CREEK AT BERTLESON AND STEWART	900911	4						
7	USGS	440314	1230911	A-3 AT 5TH & WALLIS ABOVE BERTLESON SLOUGH	900911	4						
8	USGS	440322	1230932	A3 AT MID BERTLESON SLOUGH	900912	4						
9	USGS	440322	1230940	A-3 AT BERTLESON SLOUGH OUTFALL	900911	4						
10	USGS	440329	1231120	AMAZON CREEK BELOW ARROWSMITH	900910	4						
11	USGS	440347	1231113	A-3 AT ROOSEVELT AND TERRY	900911	4						
12	USGS	440347	1231146	AMAZON CREEK AT 29TH & HILYARD	900913	4						
21	DEQ	453411.3	1224317.8	SWAN ISLAND CHANNEL AT COAST GUARD DOCK	880126	41	9	U	9	U	9	U
21	DEQ	453411.3	1224317.8	SWAN ISLAND CHANNEL AT COAST GUARD DOCK	880126	41	9	U	9	U	9	U
22	DEQ	453404.3	1224304.4	SWAN ISLAND CHANNEL OPP CENEX TOWER	880126	41	12	U	12	U	12	U
22	DEQ	453404.3	1224304.4	SWAN ISLAND CHANNEL OPP CENEX TOWER	880126	41	15	U	15	U	15	U
23	DEQ	453403.5	1224255.6	SWAN ISLAND CHANNEL AT BOAT RAMP	880126	41	14	U	14	U	14	U
23	DEQ	453403.5	1224255.6	SWAN ISLAND CHANNEL AT BOAT RAMP	880126	41	15	U	15	U	15	U
24	DEQ	453505	1224550	WILLAMETTE RIVER AT ST JOHNS BRIDGE	880201	41	4	U	4	U	4	U
24	DEQ	453505	1224550	WILLAMETTE RIVER AT ST JOHNS BRIDGE	880201	41	8	U	8	U	8	U

Remark codes:

U = Material was analyzed for but not detected

K = Actual value is known to be less than the value given

J = Estimated value; value not accurate

APPENDIX B-4. SEDIMENT VOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	CHLORO ETHANE	CHLORO FORM	BROMO FORM	DICHLORO BROMO METH	DICHLORO DIFLUORO METH	ETHYL BENZ	METHYL BROMIDE	METHYL CHLORIDE	METHYLENE CHLORIDE	TETRA CHLOR ETHENE
1	900913										
2	900912										
3	900913										
4	900912										
5	900912										
6	900911										
7	900911										
8	900912										
9	900911										
10	900910										
11	900911										
12	900913										
21	880126	18	U	9	U	9	U	18	U	9	U
21	880126	18	U	9	U	9	U	18	U	18	U
22	880126	25	U	12	U	12	U	25	U	2	J
22	880126	30	U	15	U	15	U	30	U	15	U
23	880126	28	U	14	U	14	U	28	U	14	U
23	880126	29	U	15	U	15	U	29	U	15	U
24	880201	9	U	4	U	4	U	9	U	4	U
24	880201	16	U	8	U	8	U	16	U	8	U

APPENDIX B-4. SEDIMENT VOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	TRI CHLOR ETHENE	TRICHLOR FLUORO METH	VINYL CHLOR	1,1-DI CHLORO ETHANE	1,1-DI CHLORO ETHENE	1,1,1-TRI CHLORO ETHANE	1,1,2-TRI CHLORO ETHANE	1,1,2,2-TETRA CHLORO ETHANE	1,2-DI CHLORO ETHANE	1,2-DI CHLORO BENZENE
1	900913										200 K
2	900912										200 K
3	900913										200 K
4	900912										200 K
5	900912										200 K
6	900911										200 K
7	900911										200 K
8	900912										200 K
9	900911										200 K
10	900910										200 K
11	900911										200 K
12	900913										200 K
21	880126	9 U	9 U	18 U	9 U	9 U	9 U	9 U	9 U	9 U	9 U
21	880126	9 U	9 U	18 U	9 U	9 U	9 U	9 U	18 U	9 U	18 U
22	880126	12 U	12 U	25 U	12 U	12 U	12 U	12 U	25 U	12 U	820 U
22	880126	15 U	15 U	30 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U
23	880126	14 U	14 U	28 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U
23	880126	15 U	15 U	29 U	15 U	15 U	15 U	15 U	15 U	15 U	15 U
24	880201	4 U	4 U	9 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
24	880201	8 U	8 U	16 U	8 U	8 U	8 U	8 U	8 U	8 U	510 U

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APPENDIX B-4. SEDIMENT VOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	1,2-DI CHLORO PROPANE	TR-1,2-DI CHLORO ETHENE	1,2,4-TRI CHLORO BENZENE	1,3-DI CHLORO BENZENE	1,4-DI CHLORO BENZENE	TR-1,3-DI CHLORO PROPENE	CIS-1,3-DI CHLORO PROPENE		ACETONE	2-HEXANONE	1,1,1,2-TETRA CHLORO ETHANE
1	900913			200 K	200 K	200 K						
2	900912			200 K	200 K	200 K						
3	900913			200 K	200 K	200 K						
4	900912			200 K	200 K	200 K						
5	900912			200 K	200 K	200 K						
6	900911			200 K	200 K	200 K						
7	900911			200 K	200 K	5 K						
8	900912			200 K	200 K	10 K						
9	900911			200 K	200 K	10 K						
10	900910			200 K	200 K	200 K						
11	900911			5 K	200 K	200 K						
12	900913			200 K	200 K	200 K						
21	880126	9 U	9 U	9 U	9 U	9 U	9 U	9 U	30 U	18 U	9 U	U
21	880126	9 U	9 U	18 U	18 U	18 U	9 U	9 U	43 U	18 U	18 U	U
22	880126	12 U	12 U	820 U	820 U	820 U	12 U	12 U	51 U	25 U	25 U	U
22	880126	15 U	15 U	15 U	15 U	15 U	15 U	15 U	37 U	30 U	15 U	U
23	880126	14 U	14 U	14 U	14 U	14 U	14 U	14 U	29 U	28 U	14 U	U
23	880126	15 U	15 U	15 U	15 U	15 U	15 U	15 U	34 U	29 U	15 U	U
24	880201	4 U	4 U	4 U	4 U	4 U	4 U	4 U	18 U	9 U	4 U	U
24	880201	8 U	8 U	510 U	510 U	510 U	8 U	8 U	35 U	16 U	8 U	U

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APPENDIX B-4. SEDIMENT VOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	FLUORO BENZENE	1,3-DI CHLORO PROPANE	1,1-DI CHLORO PROPENE	DIBROMO CHLORO PROPANE	2,2-DI CHLORO PROPANE	CIS-1,2-DI CHLORO ETHENE	VINYL ACETATE	CARBON DISULFIDE
1	900913								
2	900912								
3	900913								
4	900912								
5	900912								
6	900911								
7	900911								
8	900912								
9	900911								
10	900910								
11	900911								
12	900913								
21	880126	9	U	9	U	9	U	18	U
21	880126	9	U	9	U	9	U	18	U
22	880126	12	U	12	U	12	U	25	U
22	880126	15	U	15	U	15	U	30	U
23	880126	14	U	14	U	14	U	28	U
23	880126	15	U	15	U	15	U	29	U
24	880201	4	U	4	U	4	U	9	U
24	880201	8	U	8	U	8	U	16	U

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APPENDIX B-5. SEDIMENT DIOXINS AND FURANS IN WILLAMETTE RIVER BASIN, 1987-92

LOCATION NAME	SAMPLE SIZE	MEAN 2,3,7,8-TCDD (pg/g)	MEAN 2,3,7,8-TCDF (pg/g)
MIDDLE FORK	3	<0.31	<0.61
HARRISBURG	3	<0.12	<0.16
HALSEY	3	<0.12	<0.18
CORVALIS	2	<0.12	<0.19
SALEM	2	0.48	1.08
PORLAND	3	1.62	10.11

The detection limits (0.16 pg/g for TCDF and 0.12 pg/g for TCDD) were inserted for values below detection when means were computed.

Source: Curtis et al. (1992)

APPENDIX B-3. SEDIMENT SEMIVOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	ISOPROP BENZENE	.1,2,3 TRICHLORO BENZENE	N-BUTYL BENZENE	1-METH-4 ISOPROP BENZENE	SEC BUTYL BENZENE	1,3,5-TRI METHYL BENZENE	1,2,4 TRI METHYL BENZENE	TERT BUTYL BENZENE	1-METH-4 CHLORO BENZENE	1,2,3-TRI CHLORO PROPANE
1	900913										
2	900912										
3	900913										
4	900912										
5	900912										
6	900911										
7	900911										
8	900912										
9	900911										
10	900910										
11	900911										
12	900913										
13	880815										
14	880815										
15	880815										
16	880810										
17	880815										
18	870324										
19	870324										
20	870324										
21	880126	9	U	9	U	9	U	9	U	9	U
21	880126	9	U	9	U	9	U	9	U	9	U
22	880126	12	U	12	U	12	U	12	U	12	U
22	880126	15	U	15	U	15	U	15	U	15	U
23	880126	14	U	14	U	14	U	14	U	14	U
23	880126	15	U	15	U	15	U	15	U	15	U
24	880810										
24	880815										
25	880201	4	U	4	U	4	U	4	U	4	U
25	880201	8	U	8	U	60	U	8	U	8	U
25	880810										

APPENDIX B-3. SEDIMENT SEMIVOLATILES (UG/KG) IN WILLAMETTE RIVER BASIN, 1987-92

STATION NUMBER	DATE	BROMO BENZENE	METHYL BENZENE	DIBROMO METHANE	PROPYL BENZENE	1,2-DI METHYL BENZENE	1-CHLORO 2-METHYL BENZENE	P-CRESOL	4-CHLORO ANILINE	2-METHYL NAPHTHA	2-NITRO ANILINE
1	900913										
2	900912										
3	900913										
4	900912										
5	900912										
6	900911										
7	900911										
8	900912										
9	900911										
10	900910										
11	900911										
12	900913										
13	880815										
14	880815										
15	880815										
16	880810										
17	880815										
18	870324										
19	870324										
20	870324										
21	880126	9	U	9	U	9	U	9	U	910	U
21	880126	9	U	9	U	9	U	9	U	180	J
22	880126	12	U	12	U	12	U	12	U	1100	U
22	880126	15	U	15	U	15	U	4	U	15	U
23	880126	14	U	14	U	14	U	4	J	14	U
23	880126	15	U	15	U	15	U	4.7	J	15	U
24	880810										
24	880815										
25	880201	4	U	0.6	J	4	U	4	U	4600	U
25	880201	8	U	6800	J	8	U	1	J	5300	U
25	880810										

APPENDIX A-15

SEDIMENT CHEMISTRY DATA

Reference

Britton, J. 1992. Lower Willamette River Sediment Evaluation—Portland Harbor. Prepared by J. Britton, CENPP-PE-HR, U.S. Army Corps of Engineers.

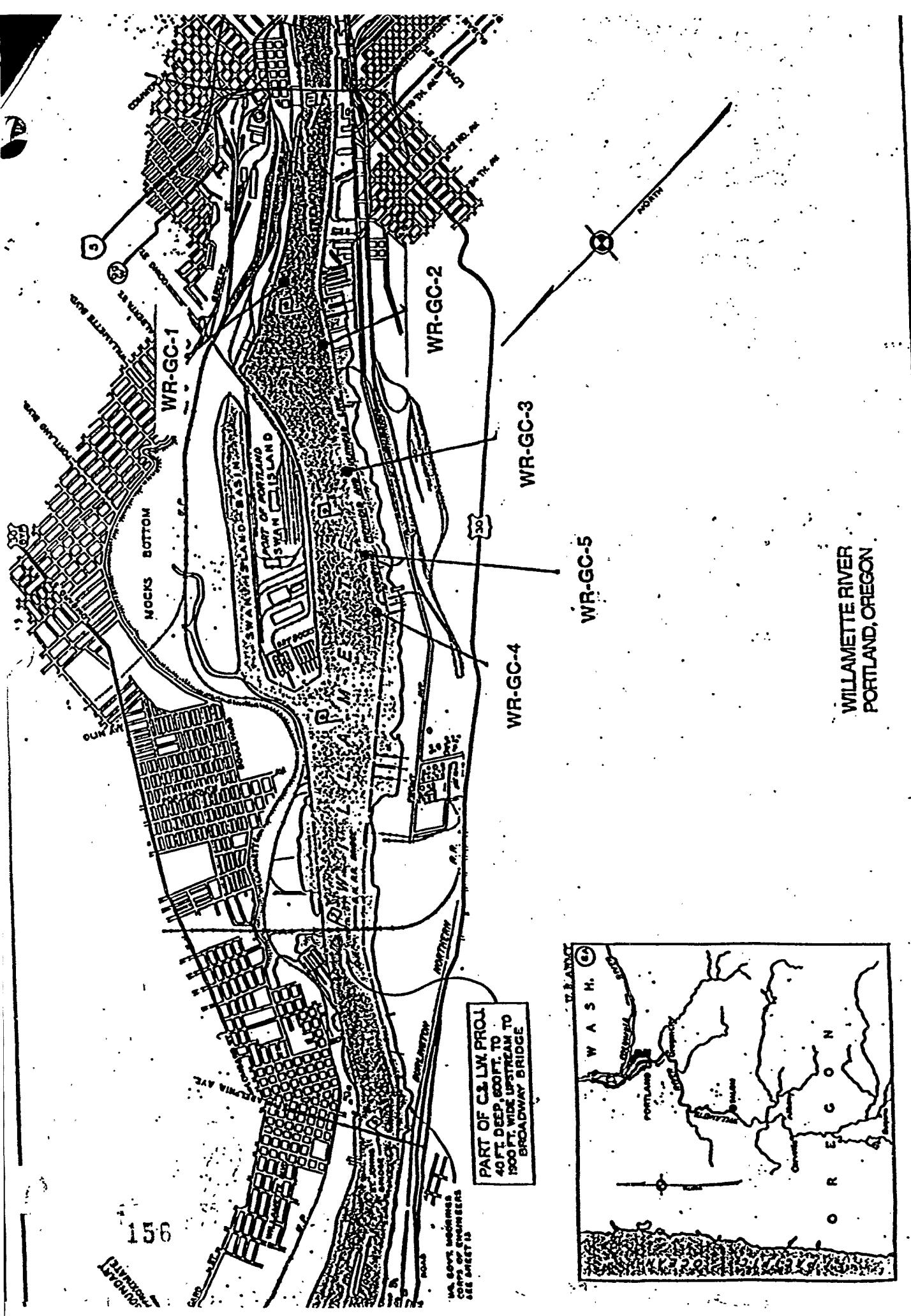


Table 1. Results of physical analyses of Portland Harbor sediment samples, 1992.

sample	core length inches	mean gr. size mm	sand	silt	clay %	volatile solids	TOC
WR-GC-1	25	0.061	33.4	58.3	8.3	7.2	2.23
WR-GC-2 TOP	6	0.034	16.7	73.7	9.6	8.8	2.34
WR-GC-2 BOT	19	0.320	93.2	5.9	0.9	1.4	0.10
WR-GC-3	53	0.050	32.1	59.5	8.4	7.0	2.78
WR-GC-4	42	0.030	14.3	74.6	11.1	8.1	2.71
WR-GC-5	53	0.028	11.5	75.5	13.0	8.8	2.88
mean*	-	0.084	33.2	58.0	8.8	6.9	2.25

* WR-GC-TOP/BOT were combined into one weighted number for use in the mean calculation.

Table 2. Metals concentrations in Portland Harbor sediment samples, 1992.

sample	As	Cd	Cr	Cu	Pb ppm	Hg	Ni	Zn	AVS um/g
WR-GC-1	3.0	0.40	35.0	43.0	29.0	0.13	25.0	*196.0	0.85
WR-GC-2 TOP	3.0	0.20	34.0	46.0	14.0	0.12	26.0	116.0	0.41
WR-GC-2 BOT	2.0	<0.10	15.0	16.0	3.0	<0.02	17.0	46.0	<.05
WR-GC-3	3.0	0.20	35.0	41.0	14.0	0.12	24.0	101.0	0.44
WR-GC-4	3.0	0.20	33.0	47.0	17.0	0.09	24.0	116.0	0.47
WR-GC-5	4.0	0.20	34.0	46.0	14.0	0.10	26.0	113.0	0.29
mean	3.0	0.24	31.0	39.8	15.2	0.11	23.7	114.7	0.49
mean 1988	3.9	0.31	23.2	45.0	21.9	0.10	36.8	157.0	-

* exceeds EPA, Region 10 screening level but is below Portland District's concern level

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Table 3. Concentrations of pesticides and PCBs in Portland Harbor sediment samples, 1992.

sample	Delta-BHC	4,4' DDE	4,4' DDD ppb	endosulfan II	PCBs
WR-GC-1	6	3	3	<2	<10
WR-GC-2 TOP	<2	3	4	<2	<10
WR-GC-2 BOT	<2	<2	<2	<2	<10
WR-GC-3	3	2	<2	<2	<10
WR-GC-4	6	3	<2	2	<10
WR-GC-5	<2	<2	4	<2	<10

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Table 4. Concentrations of PAHs and phenols in Portland Harbor sediment samples, 1992.

sample	PAHs									total
	3- & 4-methyl phenol	2-methyl naphthalene	phenanthrene	fluoranthene	pyrene	benzo (a) anthracene	chrysene	benzo(b+k) fluoranthene	benzo (a) pyrene	
ppb										
WR-GC-1	110	*170	150	130	190	73	90	120	77	1,000
WR-GC-2 TOP	-	-	-	120	120	-	-	-	-	240
WR-GC-2 BOT	-	-	-	-	-	-	-	-	-	-
WR-GC-3	70	-	-	78	78	-	-	-	-	156
WR-GC-4	-	-	90	120	130	-	-	-	-	340
WR-GC-5	90	-	82	170	190	-	70	-	-	512

* exceeds EPA, Region 10 screening level